

# COAL AGE

Vol. 3

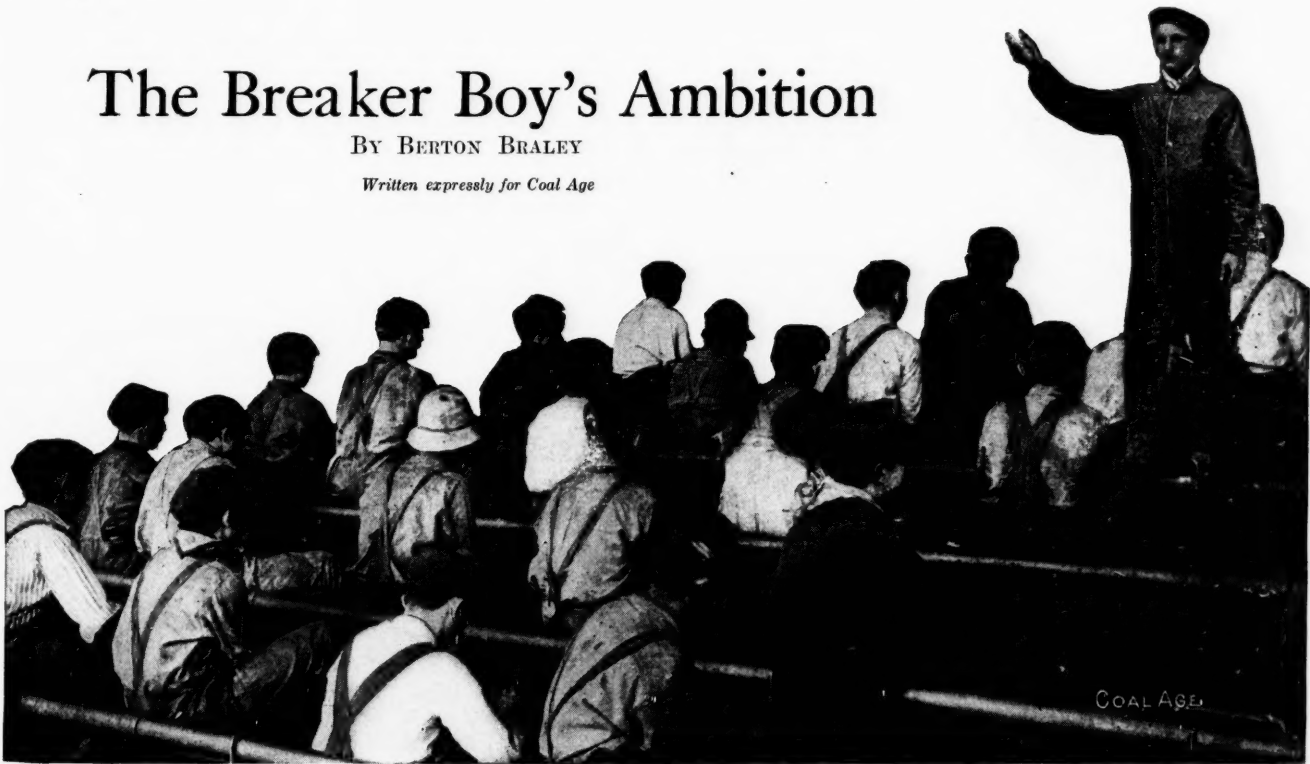
NEW YORK, MAY 3, 1913

No. 18

## The Breaker Boy's Ambition

BY BERTON BRALEY

*Written expressly for Coal Age*



I'm pickin' slate in the breaker  
And it isn't no fun, you bet,  
Fer the dust is strong an' the shift is long  
An' I'm-covered with dirt an' sweat,  
But I'm hopin' when I get older,  
(An' I reckon of course I will)  
I kin shake this mob on the breaker job  
An' handle a ratchet drill.

I'm pickin' slate in the breaker,  
But thinkin' of by an' by,  
When I reach the age I kin ride the cage  
Like a regular miner guy,  
Go down with the gang of mornin's—  
Say, wouldn't that strike me fine!  
It's me dearest dream to work in the seam  
Of an honest-to-goodness mine.

I'm pickin' slate in the breaker,  
But after a while I'll be,  
Way down below where the miners go  
A miner—you bet, that's me!  
With a light above me forehead  
An' a steel drill in me hand,  
I'll be too proud fer this breaker crowd,  
I'm gonna be something grand!

I'm pickin' slate in the breaker  
But it ain't the place I'll stay.  
I'm gonna be found way underground  
A-drawin' a miner's pay,  
An' takin' a miner's chances  
(An' plenty of *them* there be)  
It's me for the hole where they dig the coal,  
A miner—you bet—that's Me!

# A Combined Screening and Picking Table

By FRANK E. MUELLER\*

**SYNOPSIS**—Probably every coal engineer has at one time felt the necessity of a combination arrangement, whereby the coal would be simultaneously screened and cleaned, and it is rather surprising that a successful arrangement for accomplishing this has never before been evolved. The device here described seems to have met the test of hard practical usage in foreign mines for a number of years and has also been advantageously applied in West Virginia.

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The Pocahontas field of West Virginia has, among its various collieries, more picking, screening and washing plants than any other bituminous coal section of the United States. As each year passes, additional requirements are given the designers and builders of tipples in this section, due to the increasing demand for cleaner and

It is readily observed that a simple installation of this kind requires three units, which not only necessitates a large amount of machinery, but increased power, additional tipple height, greater attention and more maintenance, and, worst of all, a further handling of the coal, causing breakage or slack.

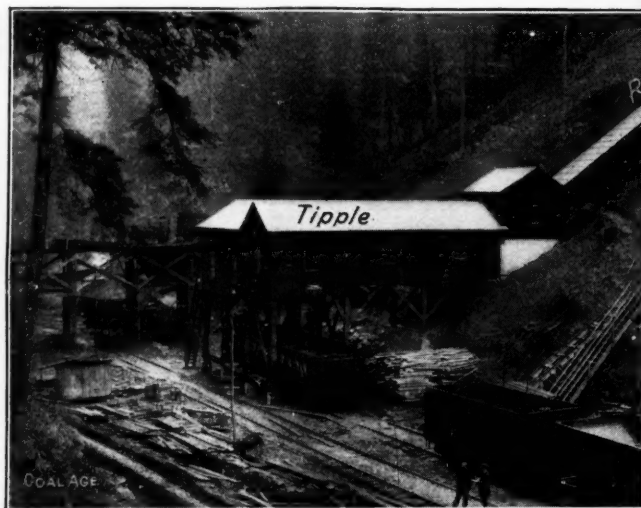


FIG. 1. GENERAL VIEW OF THE CARTER COAL CO.'S PLANT AT COALWOOD, W. VA.

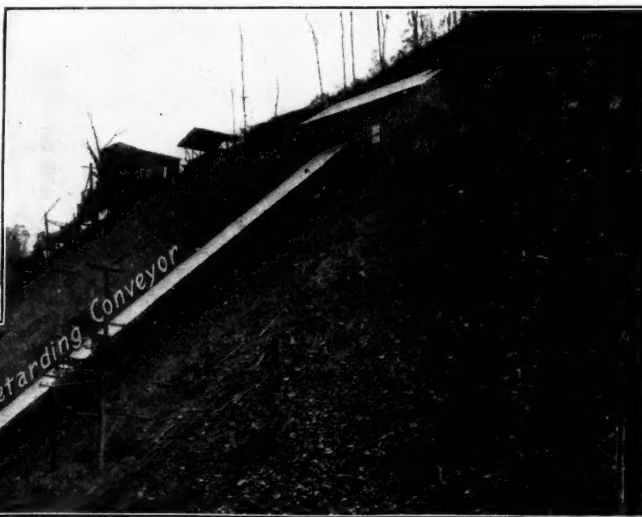
better-sized coal. This demand includes shaking screens and picking tables for the larger grades of coal, such as nut, egg, and lump, and for washeries for improving the screenings.

## THE "MARCUS" SYSTEM IN WEST VIRGINIA

Great care must be exercised in the design of a tipple for this field because the Pocahontas coal, as everyone knows, breaks up very easily. It must be handled as little as possible, the screening, picking and other machinery being arranged to give the minimum breakage and at the same time be as effective as possible.

The common procedure in an ordinary screening and picking installation is to introduce a shaker screen with, say, 2-in. perforations. The coal passes over this screen onto the picking table, and is then discharged directly into railroad cars or a lowering boom. The slack from the screens passes directly to a washery, if there is one, or is conveyed to the end of the picking table to be mixed back with the picked lump coal in making picked run-of-mine; or it may be discharged directly into railroad cars.

\*Contract engineer, Roberts & Schaefer Co., Chicago, Ill.



To overcome all these difficulties, the Carter Coal Co., at Coalwood, W. Va., have recently put into successful operation a new tipple, embodying the new "Marcus" combination screen and picking table, a brief description of the plant being as follows:

The coal, as shown in Fig. 1, is brought around the hillside to the dump house, where it is fed automatically onto a retarding conveyor, which delivers it to the "Marcus" combination screen and picking table. This screen, as shown in Fig. 2, is horizontal and comprises two decks. The upper deck, for the first 14 ft., is fitted with the  $\frac{1}{2} \times 2\frac{1}{2}$ -in. perforations; the balance of the screen, except a small portion at the end for rescreening, is comprised of a dead plate. The lower deck consists of a dead plate and simply serves the purpose of carrying the slack coal forward.

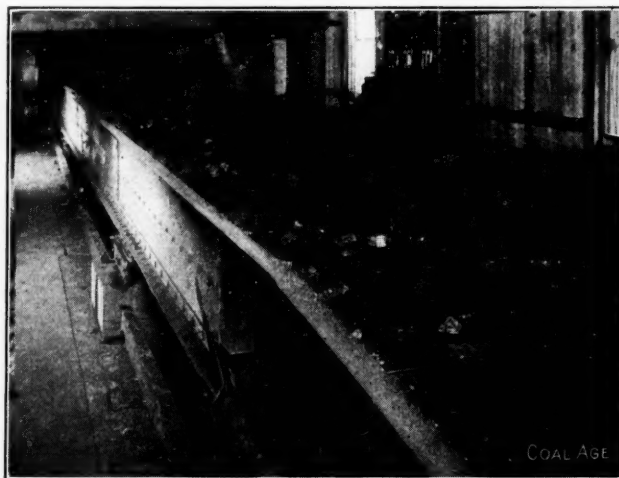


FIG. 2. COMBINED SCREEN AND PICKING TABLE

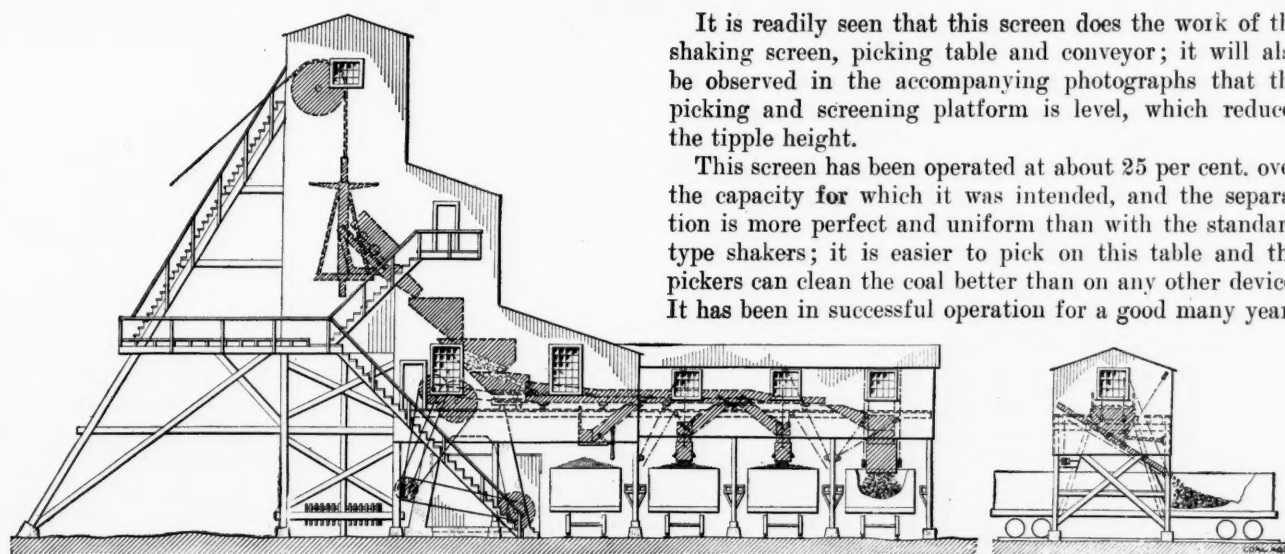


FIG. 3. THE MARION COUNTY COAL CO.'S FOUR-TRACK TIPPLE EQUIPPED WITH THE COMBINED SCREEN AND PICKING TABLE

#### COMBINATION SCREENING AND PICKING

This horizontal screen is given a peculiar to-and-fro motion, which effects a perfect screening of the coal, and at the same time moves forward that which has passed over the perforated plate so that it can be readily picked.

When the coal is received on the "Marcus" screen from the retarding conveyor above mentioned, the slack is removed at once, dropping below onto the horizontal dead plate. The nut, egg and lump remaining on the perforations, pass on over the dead plate, where they are picked, and then discharged directly onto a loading boom and loaded as lump coal; or they can be mixed again with the slack coal, which has also been brought forward on the lower deck, and shipped as run-of-mine. Gates have been provided in the lower deck for loading the slack on a separate track when picked lump is being prepared.

in England, Germany, Canada and other countries, and has just been introduced in the United States by the Roberts & Schaefer Co., of Chicago, Ill., who own the rights.

#### AN ILLINOIS INSTALLATION

The simplicity of the device and its method of installation, is shown in Fig. 3, which is the remodeled tipple of the Marion County Coal Co., at Centralia, Ill. This company originally had a three-track shaker-screen tipple, making lump, egg and screenings, a common form of tipple in use in Illinois. Within the past year, however, operators have considered the necessity of better preparing the lump and egg sizes which heretofore have been picked on the railroad cars. The installation of picking tables is now being considered and the Marion County Coal Co.

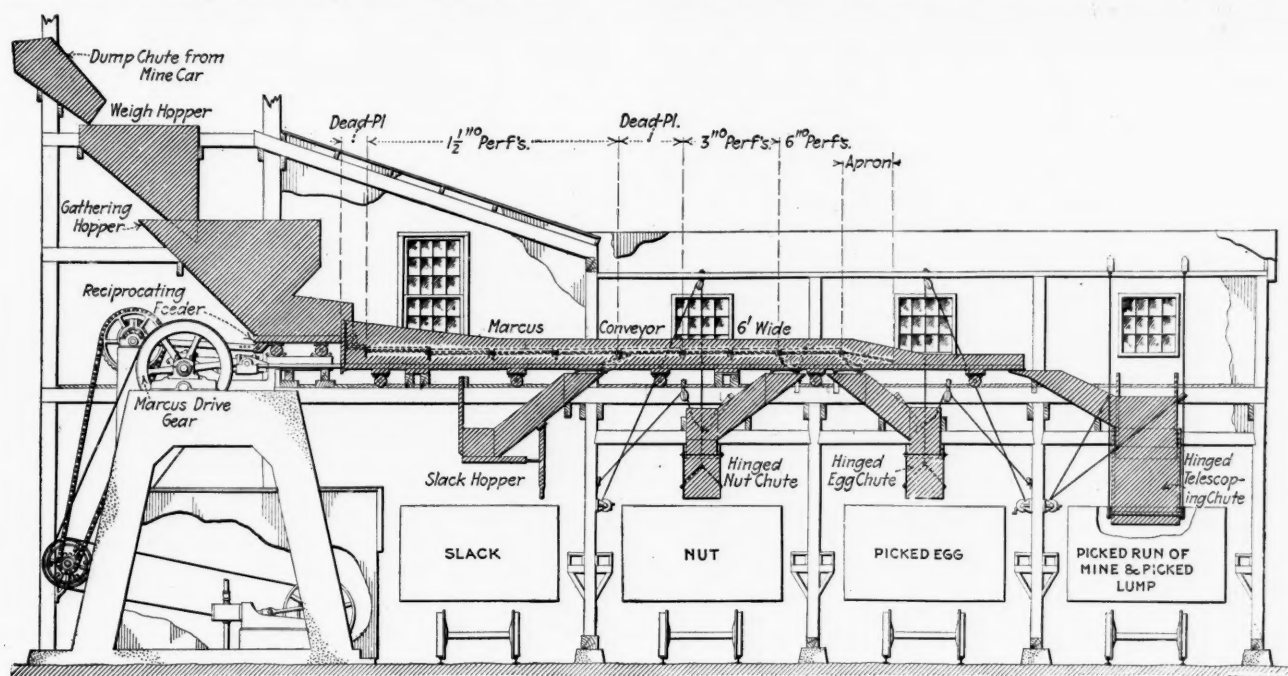


FIG. 4. AN ENLARGED VIEW OF THE "MARCUS" SCREENING ARRANGEMENT ON THE MARION COUNTY COAL CO.'S TIPPLE

is one of the first in Illinois to adopt this method in their tippie. After having carefully made an inspection of the "Marcus" installation at Coalwood, W. Va., they decided to rebuild their present three-track shaker-screen tippie, making it into a four-track plant. This could be accomplished by introducing the "Marcus" system, which also gave them the benefit of picking the lump and egg before it was discharged into the railroad cars.

The simplicity with which this device could be installed in the old tippie is readily apparent by observing Fig. 3. No change has been made in the arrangement of cages, sheave wheels, dump chutes or weigh hopper; in fact, there was sufficient height to install the screen between the bottom of the weigh hopper and the tracks, and also provide a reciprocating feeder. The coal from the self-dumping cages is discharged into a weigh hopper and then deposited in the small dump hopper, from which it is fed uniformly, by means of the reciprocating feeder onto the screen, the following sizes being prepared:

Lump over 6-in. perforation.  
Egg over 3-in. perforation, through 6-in. perforation.  
Nut over 1½-in. perforation, through 3-in. perforation.  
Screenings through 1½-in. perforation.

The lump and egg is picked on the upper deck and by means of the valves shown, delivered to the railroad cars through the hinged and telescoping chutes; or by closing the valves, picked run-of-mine coal can be loaded on the outside track. Fig. 4 shows in an enlarged detail the arrangement.

This device has met with such favor abroad, in Canada, and in West Virginia, that the operators in this country will, no doubt, investigate it carefully, not only because of its better screening and cleaning possibilities, but owing to the fact that it eliminates the moving machinery that is necessary with screens, picking tables, and conveyors. At the same time it gives a cheaper tippie, due to its low cost, low power, maintenance and low cost of operation. Obviously a more effective cleaning can be done where the coal is handled in this way.

## Coal Preparation in Eastern Kentucky

**SYNOPSIS**—Coal is here prepared for market in four sizes. Gravity screens, shaker screens, knocker screens, picking bands and loading booms are all used to secure effective separation and prevent degradation of lumps.

The VanLear mines, four in number, located on the Big Sandy division of the Chesapeake & Ohio R.R. in the newly developed coal field of eastern Kentucky and belonging to the Consolidation Coal Co., are worthy of more than casual notice, both on account of the machin-

built by the Fairmont Mining Machinery Co. All conform closely to the one described and illustrated below.

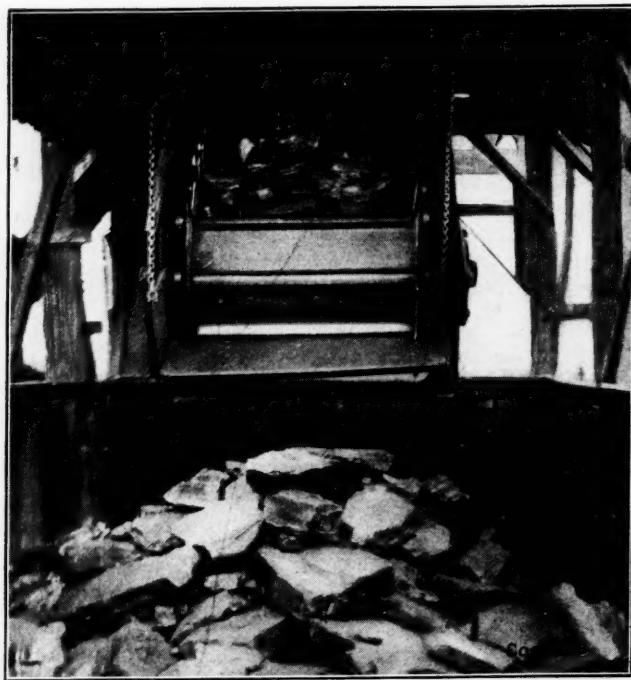
The coal is first dumped from the mine cars and passes over a 3-in. gravity bar screen, set on a slope of 21 deg. On account of the large size and the flatness of some of the lumps, some fine coal tends to ride upon the larger



VIEW ALONG THE PICKING BAND

ery installed and the quality of the coal itself. This is a slabby lump bituminous, but quite hard and brittle, semi-anthracite in nature.

Before shipping this coal to market it is screened into four grades, the larger sizes being loaded so as to avoid as much as possible any breakage, and the utmost care is exercised in its preparation. Each of the four mines above mentioned is equipped with an extensive plant



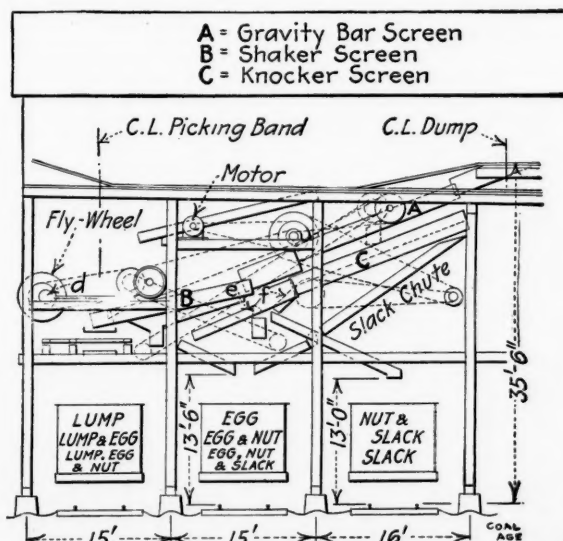
THE END OF THE LOADING BOOM

pieces. This is dislodged by a drop of about 12 in. at the foot of the screen, which causes the lumps to either turn over or tilt. A shaker screen *B* then receives the coal, making a final separation of the lumps from the smaller sizes.

This screen is 5 ft. wide and 17 ft. long over all, the bottom being perforated with 3-in. diameter holes for 12 ft. of its length. It is set on a slope of 12 deg. and

driven by eccentrics and eccentric rods with 6 in. of a throw, the shaft making 100 r.p.m. From the shaker the clean lump coal passes onto the picking band.

The screenings from the shaker are caught in a pan attached underneath it and deflected to one side into a conveyor. This is of the scraper type set on a 32-deg. slope with a single strand of welded-steel link chain and flights 12 in. long by 8 in. deep curved slightly forward on the bottom, suspended at intervals. This conveyor delivers the screenings to the knocker screen *C* located directly below the bar screen *A*. Here the screenings from the shaker mingle with those from the gravity bar screen and pass over the knocker screens together.



SECTION OF SCREENING PLANT, SHOWING SCREEN ARRANGEMENT

The knocker screen *C* is pivoted at the upper end and raised at the lower end by means of offset cams on a shaft at the rate of 200 elevations per minute. The rise of the cams is  $1\frac{1}{2}$  in. and the return blow of the screen is taken by stout wood blocks. This screen is set on a slope of 21 deg. It is made in two decks, the bottom of the upper deck being perforated with  $2\frac{1}{2} \times 1\frac{1}{2}$ -in. holes, the lower deck with  $\frac{1}{2} \times 1\frac{1}{4}$ -in. slots.

The egg coal which passes over may be dropped through a fly at *E* into a conveyor of similar construction to that previously described and elevated to the picking band, there mingling with the lump coal, or it may be loaded on track No. 2. The nut coal may either be thrown in with the egg or passed through a fly at *F* and loaded as shown.

The picking band is 3 ft. 6 in. wide, mounted on 12-in. pitch chain with 5-in. rollers every foot. It moves at a speed of 40 ft. per min. The horizontal portion of the band is 18 ft. long, allowing ample space for pickers to remove any slate from the coal.

To avoid dropping the coal into the cars a loading boom is provided, which consists of a structural-steel frame pivoted at the upper end and adjustable at the lower, and carrying guides for the picking band.

The lump coal, after leaving the shaker screen, is carried by the band and loading boom and placed either on the car bottom or on the pile in the car without appreciable breakage. The lowest slant of the boom is 22 deg. and its highest position may be horizontal, adjustment

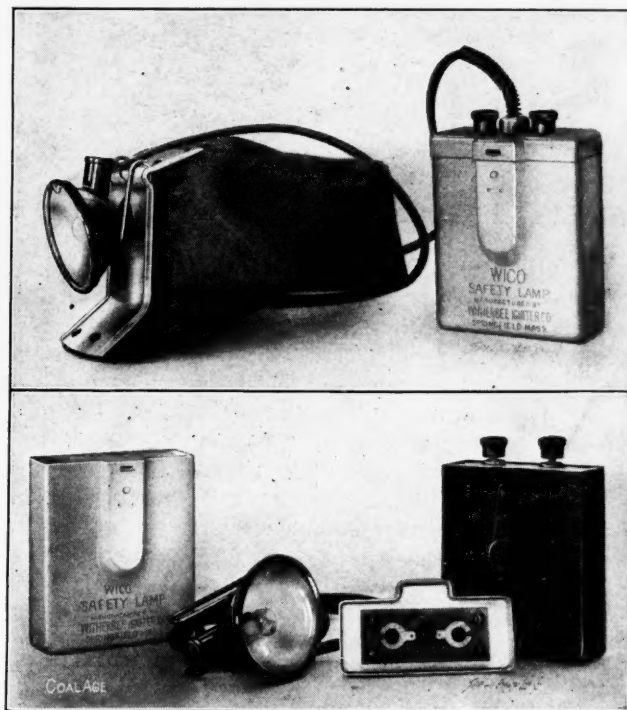
being gotten at any intermediate points as desired. Upon starting to load a car, it is used in its low position, being raised for topping out as soon as one end is filled and kept at this height until the car is loaded. By this means, a car may be trimmed without any danger whatever from a rush of coal.

The raising and lowering device for the loading boom is worthy of attention. Power is taken from the same motor that drives the picking band and is governed by means of a friction clutch located at *G*. A brake is also mounted on this same shaft. The levers are so arranged that when the clutch is thrown in, the brake is released, and, upon disengaging the clutch, the brake is at the same instant automatically applied.

The capacity of this plant is governed by the efficient capacity of the shaking screen. For good results, the average depth of coal upon this part of the apparatus should not exceed 6 in. The forward movement of the coal upon the screen is approximately 50 ft. per min. The capacity is thus 125 cu.ft. per min., or  $187\frac{1}{2}$  tons per hour, which is equivalent to 1500 tons per 8-hr. day.

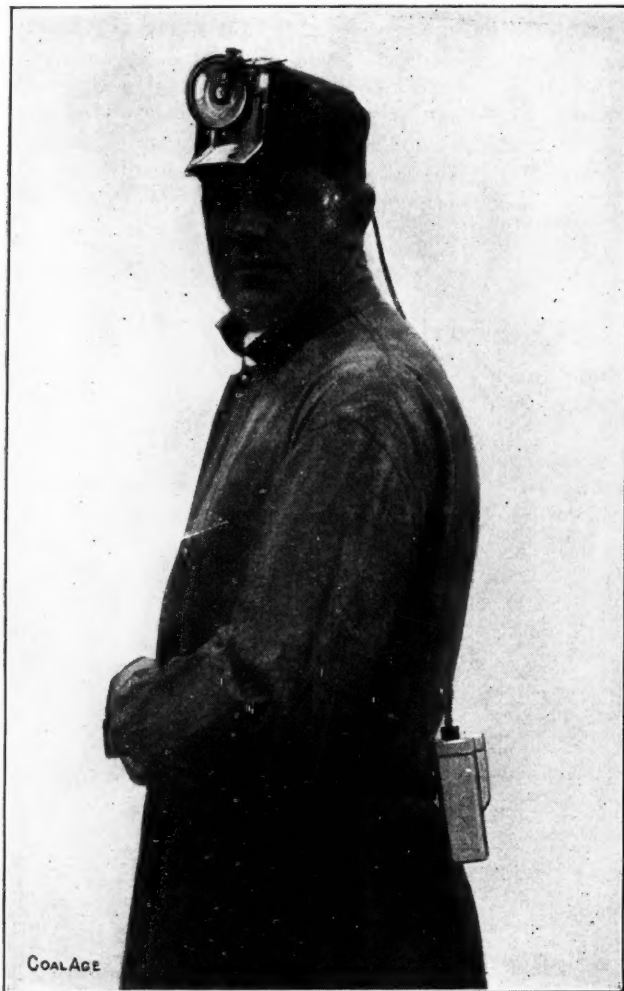
### A New Electric Miners' Lamp

By an ingenious arrangement of vent tubes, the With-erbee Igniter Co., of Springfield, Mass., has developed an acid-tight, lead storage battery, for the electric head lamp which permits of the use of free electrolyte. Thus the standard construction of lead accumulators is adapted to the ordinary miners' use and the resulting gain in efficiency, life of plates and hours of service, in proportion to weight, is expected to greatly accelerate the fast growing popularity of this type of electric lamp. J. T. Jennings, electrical engineer of the Philadelphia & Reading Coal & Iron Co., placed a large number of these lamps in service over a year ago and the manufacturers acknowledge his valuable assistance in perfecting many of the details of construction of the Wico Safety Electric Lamp.



DETAIL VIEW OF THE LAMP AND ITS APPURTENANCES

It might be called extraordinary, were it not so common an occurrence in inventions generally, that battery manufacturers have overlooked the possibility of venting a cell in the manner here employed. Two tubes are sealed into the cover of the acid chamber with their upper and lower extremities in diagonally opposite corners. A constant acid level is maintained by filling through a plug in the side of the jar, and while the battery is in the normal position, both tubes vent freely. If the battery be turned on its side, one of the tubes, of course, has its



VIEW SHOWING THE WICO LAMP IN USE

lower extremity within the acid chamber, below the acid level, but its upper extremity, projecting through the cover, is above the acid level so that none can escape. The other tube, being in the opposite position, has its lower extremity within the acid chamber, above the acid level, and is, therefore, entirely free to carry off the gases without the liquid spilling unless the battery be completely inverted, and this condition maintained; as the battery is turned from side to side, first one tube and then the other serves as the vent.

At no time are the plates uncovered, and in no position that the miner may assume, will his light be diminished. Although the capacity of the battery is more than adequate to furnish light for an entire shift, it is surprisingly small and light as a direct result of the increased efficiency. The active material of the five plates is formed

in staggard grades, correctly proportioned to give the greatest capacity for weight at the desired discharge rate. The drawn aluminum housing is sufficiently stiff to resist the ordinary rough handling by miners and the connections from the battery terminals are strong and positive, spring contacts being avoided for the sake of reliability.

The latest type of bayonet-locking socket is employed to hold the tungsten bulb in the lamp, which reflects a smooth, sufficient and well diffused light and is arranged to fit on the standard oil-lamp support.

Several of the Philadelphia & Reading colliers are now equipped with the Wico Safety Lamp, and other operators are following suit. As evidence of the remarkable cleanliness of the battery, it is said that they are in great demand for candelabra equipment on hotel tables.

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## The Suitability of Explosives

The U. S. Bureau of Mines recently published *Bulletin 48*, dealing especially with tests which show the suitability of different classes of explosives for various kinds of work. It is one of a series dealing with tests of explosives and methods of reducing the risks involved in their use in mining.

Many explosives suitable for quarry work have proved unsuitable for use in mines or in closed workings. An explosive for use in gaseous or dusty coal mines must be so composed that its explosion temperature and the height and duration of its flame are reduced sufficiently to permit its being used with comparative safety. The nature of the gases evolved in detonation, the imperviousness of the explosives to moisture, their behavior in cold climates, their stability of freedom from chemical or physical change during warm weather, all have an important bearing upon their selection for any special work.

Practically every class and grade of commercial explosive is used in open-air work to meet varying conditions. This bulletin states the use to which each of the following explosives is best adapted: Black blasting powder, granulated nitroglycerin powder, "straight nitroglycerin dynamite," low-freezing dynamite, ammonia dynamite, and gelatin dynamite.

Black blasting powder is stated to be the best suited for work, in which a gradual pushing or heaving effort is desired, while "straight nitroglycerin dynamite" develops greater disruptive force than any of the other explosives tested. For this reason it should be employed for producing shattering effects, or for blasting very tough or hard materials.

The gelatin dynamites on detonation produced the smallest percentage of poisonous gases, but even these are far from being satisfactory in this respect. To obviate this objection, the Bureau had a special gelatin dynamite prepared, which, upon detonation, produced no poisonous gases. It is believed that this illustration of the possibility of producing an explosive of this class, that will not evolve poisonous gases, will result in its being commercially manufactured.

The bulletin closes with a table showing the relative potential energy, disruptive effort which bears a close relation to the shattering force of the explosive, the propulsive effect which corresponds to the pushing or heaving force of mine explosives of different classes and grades.

# Preparation of Anthracite

BY HUGH ARCHBALD\*

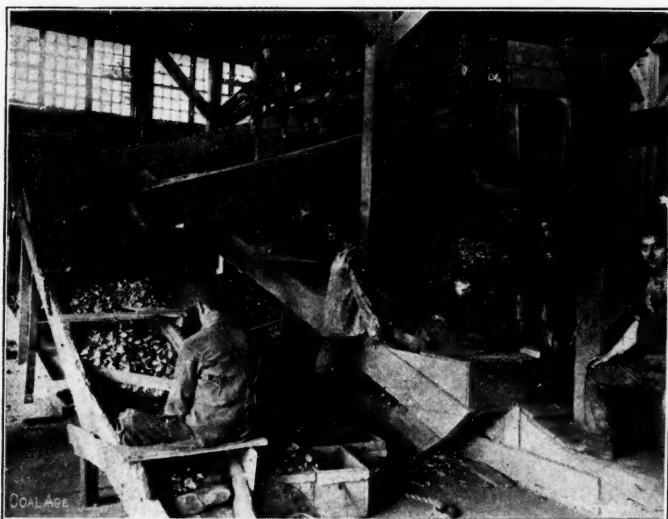
**SYNOPSIS**—A general discussion of present methods of cleaning and sizing hard coal in the anthracite field. Recent practice is quite different from the crude methods formerly used.

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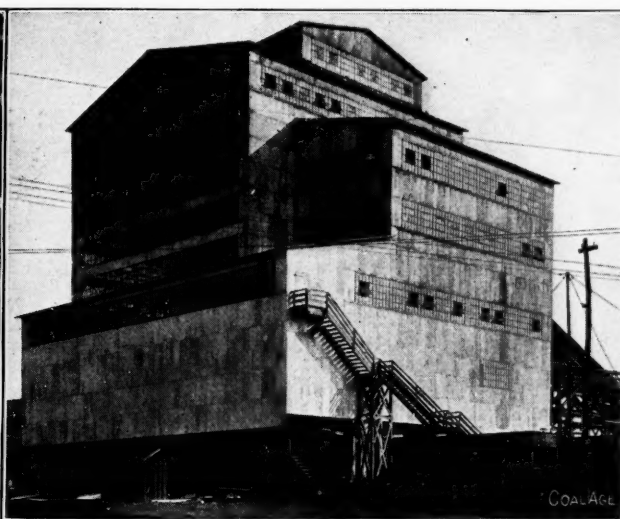
The means employed for the preparation of anthracite coal for market vary from mine to mine, according to the character of the coal which is being worked and the methods of development employed. When the coal, as it comes from the mines, is dry and bright, and the slate separates easily from the coal, the method known as dry preparation may be employed, in which no water is used in cleaning the coal. But when the run-of-mine coal is wet or stained so that it must be washed in order to make it look bright and so be more marketable, a strictly

of breakers which are under construction or have been built in the past few years, either steel or concrete or a combination of both have been used. The Sterrick Creek breaker of the Pennsylvania Coal Co., at Olyphant, Penn., is a large breaker which has been built out of steel with corrugated-iron siding. The same company is at present constructing a breaker known as the Underwood, near Throop, Penn., in which the pockets and foundations are made out of concrete, while the rest of the breaker is to be made out of steel.

The Lehigh Valley Coal Co.'s new breaker, at Mineral Spring, is built out of steel, the lining of the pockets and the flooring being made out of concrete. The D., L. & W. R.R. Co. has constructed a large breaker at Taylor, Penn., which is built entirely with reinforced concrete,



CHUTES IN AN OLD BREAKER, SHOWING CROWDED AND POORLY LIGHTED ARRANGEMENT



SHOWING STEEL- AND CORRUGATED-SIDING CONSTRUCTION ON A MODERN BREAKER

wet preparation may be used. In many breakers a combination of both wet and dry preparation is employed.

In flat seams where the coal is shoveled over by the miner before it is loaded into the car, the preliminary preparation is given in the mine, the larger pieces of rock and bone being picked out by hand and stowed in the gob. Under these conditions a deduction is made from the price paid to the miner for a car of coal if there is more than a certain amount of rock in the car, this amount varying from 300 to 500 lb. In pitching seams where the coal is drawn from a battery, such a preliminary preparation is not possible to any great extent, as the coal cannot be shoveled over. In this case everything from the seam is loaded into the mine car and the preliminary cleaning is done on the surface.

## MATERIAL USED IN BREAKER CONSTRUCTION

The majority of coal breakers in use, having been built for a number of years, have been constructed of wood, the older breakers being constructed with mortise and tenons, whereas in the more recent wooden structures, cast-iron shoulders and tie-rods are used. In a number

the only steel work being the frame which carries the conveyor that lifts the coal from the shaft to the head of the breaker. This breaker is unusually steady, there being very little movement in it when all the machinery is running, a barrel of water at the top of the breaker not indicating any movement.

The Anthracite Mine Law of Pennsylvania, which was passed in 1871, required that any breakers constructed after the passage of the act should be placed a certain distance from the shaft. The purpose of this was to avoid a repetition of the Avondale disaster of 1869, when the breaker, which was located over the shaft, burned down, smothering the men in the mine from the smoke which was carried down the shaft.

This law has necessitated the handling of the coal between the shaft and the breaker. At some mines, this is done by hoisting the coal car high enough so that it can be run over a trestle directly into the breaker. A more common practice though, is to hoist the car to the surface and there dump the coal into a conveyor which lifts it to the head of the breaker.

An advantage in this is that pockets of the conveyor, holding only a portion of the coal in a car, deliver the

\*Mining engineer, Scranton, Penn.

coal in a more uniform quantity than where the car itself is dumped directly at the head of the breaker, a better cleaning of the coal always being possible when it moves in a steady stream from the breaker. When the supply of coal from the mine comes from more than one source and is dumped from two points into the boot of the conveyor, the feed to the breaker is more even than when the cars from two points are dumped directly at the head.

#### MUST AVOID ROUGH HANDLING

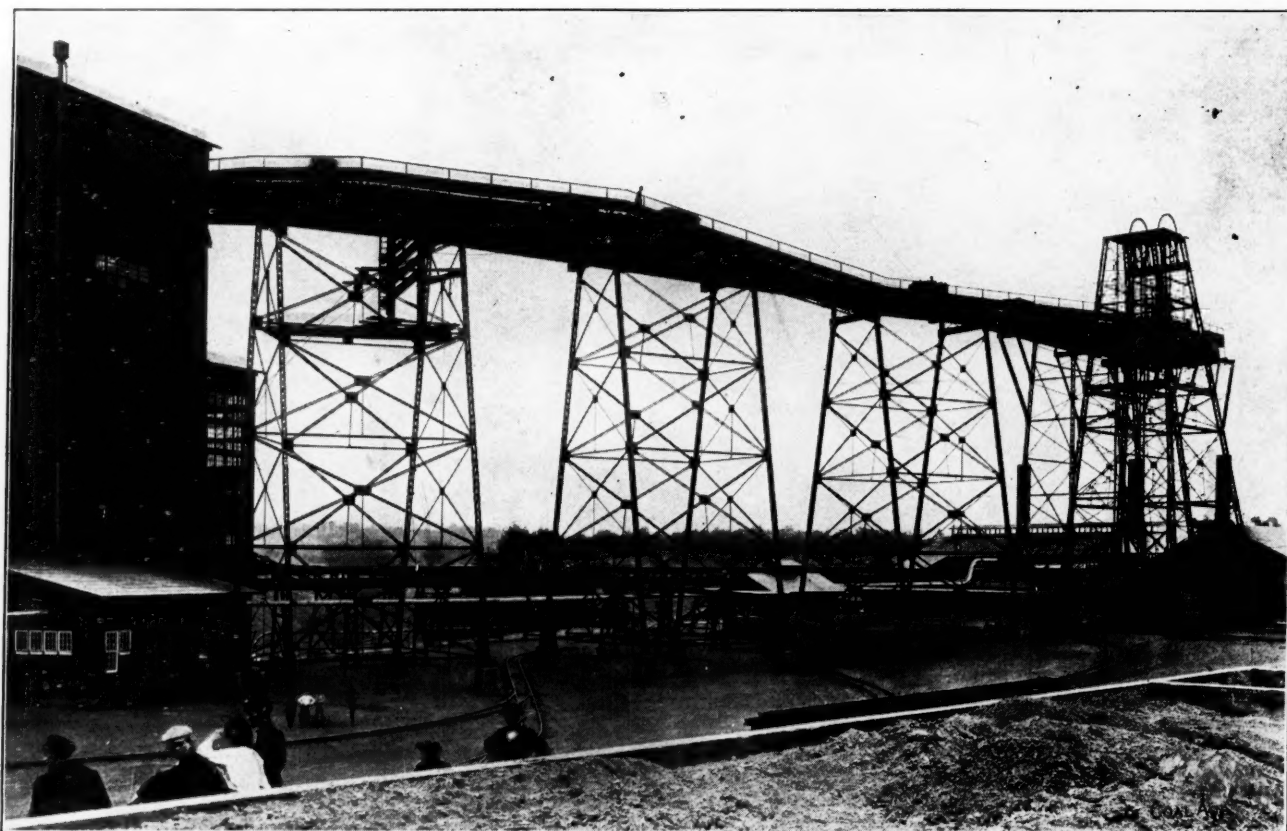
Coal should be handled in a breaker so that the least amount is broken into small sizes. It is stated that a reduction of 1 per cent. in the breakage amounts to a saving of \$75,000 a year for one large company. As the average price of coal is about \$2.40, a saving of 1 per cent. is equal to 2.4c. a ton, which can easily amount up

ried along with them. Whereas if it is shaken free from all other pieces of coal, as will happen on a shaking screen, and given time to drop, it will pass through. The disadvantage is the power required for the screens and more complicated machinery.

The lump coal is given a preliminary cleaning before going to the rolls to be crushed. This may be done in a picking chute or on a moving table. When it is done on a moving table, better cleaning can be accomplished as the pieces of coal do not move so fast as when sliding down a chute, and are not piled up one on the other as is likely to happen at the end of a chute.

#### NECESSITY OF CAREFUL CLEANING AT THE HEAD

Cleaning the coal at the head is important, for it is easier to pick out one large piece of slate in the beginning than to pick out a number of smaller pieces later on. Five



SHOWING A COMMON ARRANGEMENT, WHEREBY CARS ARE TAKEN FROM THE HEAD OF SHAFT TO BREAKER

to a large amount when the production is large. Breakage will occur as one piece of coal strikes against another or where the coal strikes against the side of the chute as it changes its direction of flow.

The coal on entering the breaker, passes over bars, either fixed or movable, or over shaking screens, so that the lump coal may be separated from that which is already broken to a more marketable size, and also to avoid passing all the coal through the rolls. The small coal is sent directly to the sizing and preparing machines.

Shaking screens are preferable to bars for making this preliminary separation, as the separation is more distinct, the reason for this being that when the coal slides down the chute and over the bars, that which should fall through, often gathers enough momentum to carry it over or may be so held by larger pieces of coal that it is car-

men at the Mineral Spring breaker of the Lehigh Valley Coal Co. do most of the hand picking which is done in that breaker. In this breaker there are three picking tables on the head. Shaking screens are employed for the preliminary sizing, and these make two products, lump, which is cleaned on the center table, and steamboat and broken, which are cleaned on tables at each side. The slate which is taken out at this point, goes directly to the waste.

After cleaning on the head, the lump coal passes through rolls to be broken down to the sizes desired. In a combination wet-and-dry breaker, it is generally the product from breaking down the lump coal that is cleaned by the dry method and goes to its separate part of the breaker.

The rolls generally employed are high-speed toothed

rolls, running at 900 r.p.m. Recently, however, slow-speed rolls, known as the Lloyd rolls, have come into use. In these rolls the revolutions have been reduced to 250 a minute and the saving in breakage below the desired sizes runs as high as 15 per cent. They are compound geared and the teeth are set in staggered rows and do not overlap as in the old high-speed, pointed-tooth rolls. To get the best results, rolls should be fed evenly with a sized product. Even feeding is better accomplished when moving tables are employed, as coal moving out of a chute, after being held back by a gate, travels in a mass, whereas with moving tables it falls evenly over the end of the table.

After passing through the rolls, coal is sized on shaking or revolving screens, each size being prepared separately. The sizes of prepared anthracite coal and the square holes through which they will pass are as follows: Steamboat, 5 in.; lump, 4 in.; broken,  $2\frac{3}{4}$  in.; egg, 2 in.; stove,  $1\frac{3}{8}$  in.; chestnut,  $\frac{3}{4}$  in.; pea,  $\frac{1}{2}$  in.; buckwheat,  $\frac{1}{4}$  in.; rice,  $\frac{1}{8}$  inch.

In the early days of anthracite mining, no size below stove coal was prepared and the cleaning was done by hand. In those days the miner was required to rake over his coal in the chamber before loading a car and all the fine coal which passed through the rake was shoveled into the gob. The contrary is true of the present day, the smaller and cheaper sizes having increased steadily in demand, so that egg is the largest size made in some breakers. These breakers are so arranged that even egg coal can be broken into smaller sizes when there is no demand for it.

#### DRY METHODS OF PREPARATION

In breakers using the dry methods of preparation, the coal is first cleaned by mechanical pickers and then by hand. The mechanical pickers are of two types: the Emery picker and the spiral picker. In the Emery picker, the coal is separated from the slate as it slides down a chute in which there is a slot, the coal on account of its glassy surface, gaining enough velocity to make it jump the slot, whereas the slate being heavier and sliding at a slower rate, falls through. The spiral separator has a sheet-iron spiral which inclines toward the center down which the coal and slate slide. The coal, gaining greater velocity than the slate, is discharged over the edge by centrifugal force, while the slate remains on the spiral and is discharged in the center at the bottom.

In the modern breaker, built out of steel and corrugated-iron siding, attention is paid to lighting the inside of the breaker so that there may be plenty of light for picking the coal. In the old structures adapted to recent mines, the chutes for hand cleaning are often badly constructed and poorly lighted, the lack of daylight being made up by hanging an electric light over the picking chute in front of each boy. The hand picking of the coal is done by boys. It is avoided as much as possible nowadays; only the larger sizes are cleaned by hand. At one modern breaker, only two boys are employed on the clean coal, both of them working on egg coal after jiggling. After picking, the clean coal is sent into the pockets for loading onto the cars, for shipment.

In a wet breaker the cleaning of coal is done by means of jigs, the coal being sent directly from the jigs to the pockets.

One of the hard things to eliminate in cleaning coal is

flat slate. A machine has recently been devised to do this work, which can be attached to the end of the shaking screen or placed by itself in a chute. In this machine, the coal passes over a series of plates which overlap in the direction of the movement of the coal, so that as the machine moves forward, the flat slate passes back through the opening between the plates. The plates open a little at the end of each stroke in order to release any slate which may be caught between them.

#### ARRANGEMENT OF COAL POCKETS

The usual arrangement of the coal pockets is to have them parallel to the railroad track on which the loading is done. In the illustration shown of the Sterrick Creek breaker, two tracks are shown passing beneath the breaker, on both of which cars can be loaded. In contrast to this custom is the novel arrangement of the Mineral Spring breaker, where all the loading is done at one point and only one track is used. The pockets in this breaker are arranged in two opposed rows at right angles to the track, and the loading is done by means of a belt which passes through an alleyway between pockets and onto which the coal is loaded by gravity for delivery to the railroad cars. One man by a system of levers controls the gates in the pockets, the belt, and a box-car loader.

In loading by a belt, greater speed has to be given to it when the smaller sizes of coal are handled in order to throw them free from the belt at the end, and not have them stick to it, following it around. This system of loading is to be maintained in the new Franklin breaker which is being built by the same company. Another system of loading which is proposed for a breaker under construction by another company, will not have pockets in the breaker, but will have a separate track for each size of coal so as to load directly into the railroad cars.

The refuse from the breaker nowadays is generally ground up and sent back into the mines to fill up old workings. The ashes from the boiler plant are also flushed into the mines with water. The crushing is generally done with a "Williams No. 3" crusher, the largest slate sometimes being broken down in a Gates crusher.

#### BY THE WAY

Even a lion must defend itself against the flies.

❖

"Let the unions try to organize my camp," a boastful superintendent threatened, "and I'll show them." They did. He didn't.

❖

A dwarf on a giant's shoulder sees the further of the two.

❖

The Philadelphia concern that offered its employees 15c a day for taking a bath has created an opening for an awful roar from the Miners' Union.

❖

Education may not end in eminence, but, without it, eminence can hardly be attained.

❖

A party nonchalantly phoned us the other day for the address of the Anthracite Coal Trust. We referred him to ex-Attorney-General Wickersham.

❖

(Problem)—The Criminal Courts in Georgia sentence a small boy to 11 years in jail for stealing a 5c. bottle of pop. How many years should the Pennsylvania courts sentence a greedy or careless miner for crossing the fireboss' dead line?

## A Balanced Shaking Screen

**SYNOPSIS**—Double screens suspended by flexible wooden strips and driven by opposed eccentrics through resilient eccentric rods greatly reduce the noise of operation, the cost of installation and repairs, and the reflex action of the shaker upon the building.

Throughout most coal fields where the product of the mine is sized before going to market, the oscillating or shaking screen has, generally speaking, supplanted the revolving screen for sizing purposes. The principal objection to this type of apparatus has been its destructive action upon the building in which it is placed.

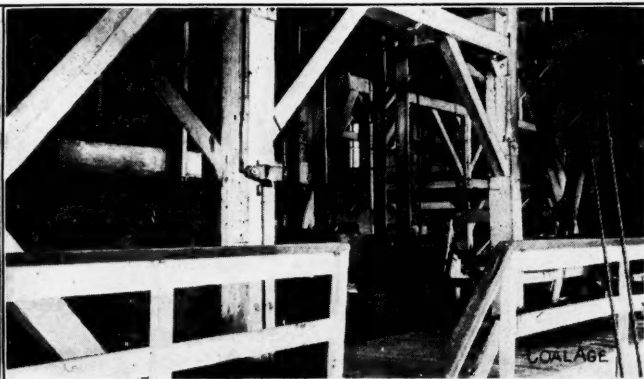
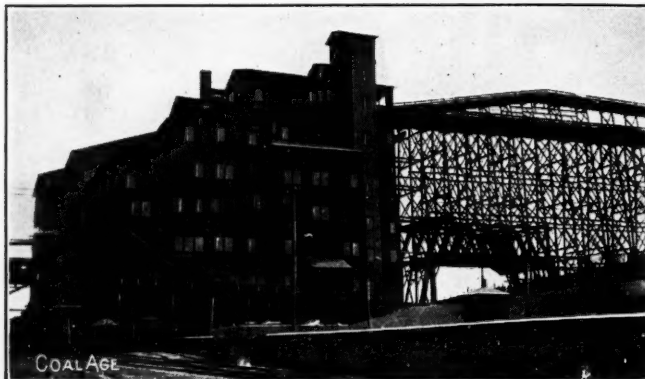
The third law of gravitation, which states that "for every action there is an equal and opposite reaction," holds as true between the coal screen and the structure whereby it is supported, as it does between the sun and the earth, or any other two heavenly bodies. The push exerted by the eccentric to force the shaker forward may be transmitted in the opposite direction to the timbers supporting the eccentric shaft, with the result that build-

between the journal and box. The greater the weight of the screen itself, or of the coal carried upon it, and the more rapid its oscillation, the more severe would become any tendency to pound.

To overcome these difficulties the Wilmot Engineering Co., of Hazelton, Penn., has placed a screen on the market which is known as the Parrish flexible-arm shaker, which is in many respects decidedly different from the older type of shaking screens.

In this apparatus the framework, carrying the perforated plates by which the coal is sized, is built up entirely of wood, being thus somewhat lighter than if made of structural-steel shapes. This framework is hung from above on a series of 1x8-in. strips of seasoned ash, which are securely bolted to both the shaker proper and to the supporting beams overhead.

The backward and forward motion of the screen framework is made possible by the elasticity of these wooden hangers, and at either extreme position of the shaker they are bent and tend to force the suspended weight



A COLLIERY WHERE THESE SHAKERS ARE USED AND THE SCREENS THEMSELVES IN OPERATION IN THE WASHERY

ings not constructed with the especial idea in mind of resisting the action of the oscillating screens have sometimes, and not infrequently, been shaken to destruction.

Attempts have been frequently made, therefore, to counterbalance or neutralize the action of the eccentric shaft upon the building itself, and, although these were more or less successful, the heavier the screens were made, the greater and more disastrous were their effects upon the structure within which they were housed.

As ordinarily constructed, shaking screens are hung from above with rods provided with boxes to allow a slight rocking both at the point of suspension and point of support upon the screen. The eccentric rods were also attached to the screens in a similar manner, the points of attachment, however, being usually provided with brass boxings similar to those used upon the ordinary steam-engine connecting-rods.

Although there was comparatively little trouble experienced from heating, or undue friction, in these various boxes, great difficulty was encountered in keeping the various joints tight. It will be readily appreciated that any lost motion, either at the points of support or at the application of power, would cause a knock in the boxings which, if unattended to, would grow steadily worse, not from friction, but on account of the pounding action

in the opposite direction. This serves to minimize the effect of the inertia of the screen-supporting framework.

In order to obviate the necessity of connecting the eccentric rods to wristpins attached to the shaker, the elasticity of seasoned wood is again taken advantage of. One end of the eccentric rod is bolted securely to the shaker framework, while the other is bolted to the eccentric straps. Between these two ends, or points of attachment, a flat strip of thoroughly seasoned white oak is interposed and securely fastened.

In order to counteract as much as possible the action of the shakers upon the building, they are usually built double, that is, one shaker above the other, or upon the opposite side of the eccentric shaft. With this arrangement and the driving eccentrics opposed to each other, the direction of travel of the two screen-bearing frames is at all times opposite, which puts as little oscillatory shaking strain upon the building as possible.

The advantages of this construction are many. All of the principle parts except the screen plates themselves being made of wood, the shaker is light in weight and cheap to install. Renewals of either hangers or eccentric rods are not frequent, but when necessary such renewals can be accomplished quickly and at small expense by an ordinary carpenter.

# Cincinnati Mine Explosion, Courtney, Penn.

By R. Dawson Hall

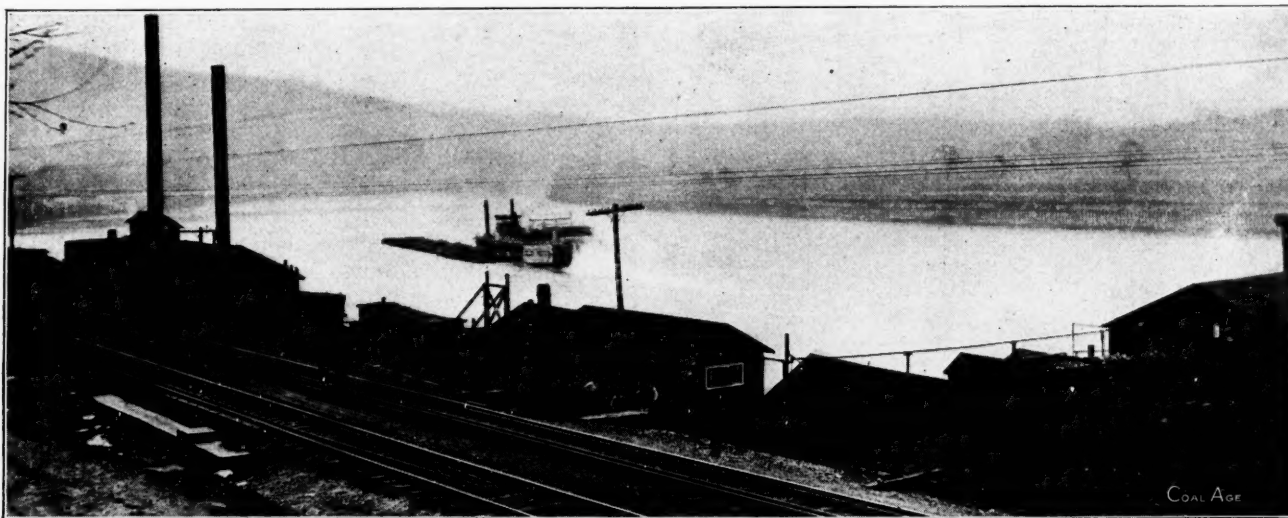
**SYNOPSIS**—A gas explosion occurred at the Cincinnati mine of the Monongahela River Consolidated Coal & Coke Co., near Courtney, Washington County, Penn., killing 96 men. The mine had been operated about three-quarters of a century and had extensive workings. Many of the men escaped through an unsuspected avenue of safety, all the provided roadways being blocked by afterdamp.

The Cincinnati mine is one of the oldest in the bituminous regions. It lays along the west or left bank of the Monongahela River, just north of the town of that name. The nearest railroad station is Courtney. A few men live in a block of wood houses between the Pennsylvania R.R. (Monongahela branch) and the river, and this block is shown in the view of the tippie. But there is no town near the mine, and the miners in general live in the many

catastrophe 96 lives just at a time when the disaster seemed unlikely to occur.

## THE SLOPE MANWAY

When C. M. Jutte & Co. still owned the mine, Henry Louttit, being mine inspector of the district, declared that the escape of the men in case of an accident was not sufficiently provided for and insisted on a new opening on Fromans Run, a branch of Mingo Creek. The court appointed D. M. Anderson, a coal operator; Henry Cook, a miner, and George D. Jenkins, a mining engineer, to report to the court. They made an examination Oct. 13, 1893, and declared that a 20-deg. slope 550 ft. long should be constructed to connect with the surface in Fromans Run. This opening constitutes the drift marked in the illustration as Mingo manway. By this steep in-



GENERAL VIEW OF THE PLANT AT CINCINNATI MINE, COURTNEY, WASHINGTON COUNTY, PENN.

villages near-by, in Monongahela, New Eagle, Riverview, Findleyville and Gastonville, for at the Cincinnati mine the river rounds sharply against the hills and makes a steep bluff, affording little room for buildings at its base and none on its slopes.

## A PIONEER MINE

This mine and the abandoned Buffalo workings adjacent were opened almost 80 years ago. Cincinnati has been operated discontinuously since that time, having passed into many different hands, being owned at different times by the Fifth and Tradesmen's National Banks, at Pittsburgh, Robert Arthurs and C. M. Jutte & Co. At all times gas has been found, not in great quantities but sufficient to serve as a menace. At one time reports aver that the mine exploded and blew cars almost across the river, but this accident is said to have occurred 30 years ago, long before the operation came under the present ownership, and the damage was to property and not to human life. According to report, gas is occasionally found in large quantities. Nevertheless, accidents have been rare until the present disaster wiped out in one

cline the men and mules enter the mine, and at its mouth the mule stable is located. It is a primitive adit such as a company might be expected to construct under legal necessity.

Thus there were two entries to the mine, the level main road with its rope haulage entering the hill opposite the tippie, and the manway about a mile away on a small run near the Mingo school house. By the first, the bodies were removed, and the rescuers entered the mine by the second. Five rescued mules were driven out of this opening about 70 hr. after the disaster, looking little the worse for their severe experience.

## THE WEATHER CONDITIONS

The explosion occurred about 12:15 in the afternoon on Wednesday, Apr. 23. The temperature was about 80 deg. F., and the weather had been warm and, therefore, unfavorable for a dust explosion for several days. Since Apr. 7, the temperature had not fallen below 30 deg. F., though on Apr. 20 the temperature fell at 6 a.m. to the freezing point. The conditions did not favor a gas explosion any more than one of coal dust, for the day was

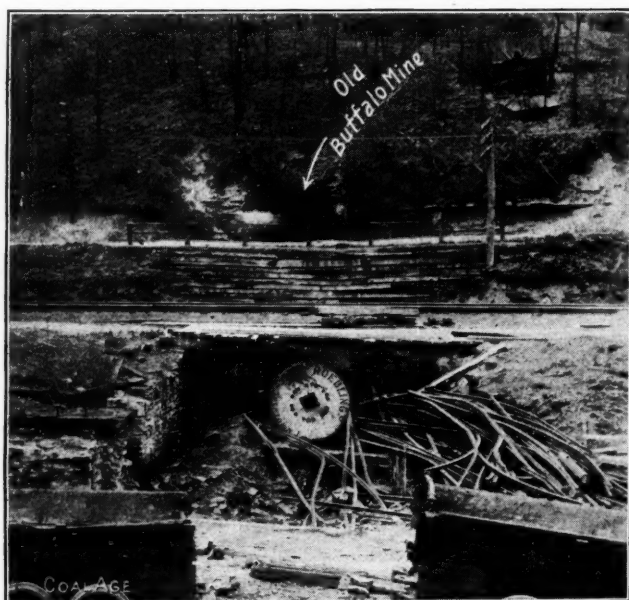
bright and the barometer did not show any marked decline. I quote the statement of the Weather Bureau:

BAROMETRIC READINGS AT PITTSBURGH STATION

Date	Hour	Inches
Apr. 20.....	8 a.m.	29.50
	8 p.m.	29.54
Apr. 21.....	8 a.m.	29.66
	8 p.m.	29.44
Apr. 22.....	8 a.m.	29.36
	8 p.m.	29.18
Apr. 23.....	8 a.m.	29.27
	8 p.m.	29.23
Apr. 24.....	8 a.m.	29.31
	8 p.m.	29.20

MAINLY A GAS EXPLOSION

Apparently the center of the explosion was not far from the 5th and 6th butts out of the 8th face. The accident



THE BUFFALO WORKINGS ADJACENT TO THE CINCINNATI MINE. SOME THINK MUCH GAS LEAKED FROM THIS MINE INTO THE CINCINNATI WORKINGS

was probably largely a gas explosion, the violence not being greatly increased by the presence of dust. The coal is about 5 ft. thick, increasing in dips to 6 or 7 ft. Above the coal is about a foot of draw slate which is hard to maintain in place. This slate is always pulled or shot down. Thus the floor normally is covered with a certain amount of broken rock which mixes with the coal dust.

The violence of the explosion has, as is usual in such cases, been exaggerated by the press. The blast blew open the explosion doors of the fan, an illustration of which ventilator is shown in the last illustration. The doors were replaced by the fan tender, made tight with sacking and loaded with iron. The fan was in no way injured. As an evidence of violence it is said that in the mine, a locomotive was blown off the tracks.

There was, however, a great deal of afterdamp, which invaded both rooms and headings. Unfortunately, the accident occurred in a heading outby from the point where many men were working. These men were thus penned in behind the clouds of afterdamp, and many more might have perished had it not been for a fortunate circumstance.

THE UNFORESEEN EXIT

Three parallel entries formed the main approaches to the portion of the mine from which the bulk of the coal

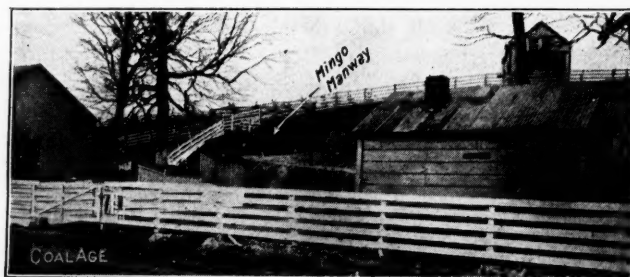
was obtained. From right to left these were No. 7, the main return, No. 8, a motor road and intake airway, and No. 9, a traveling road, also serving as an intake. Leading to the left out of these were several butt headings, each providing approach to or being prepared to provide approach to about 50 rooms. The last started was No. 21. Parallel to the face entries mentioned was No. 4 face entry, and the 15th butt heading from this entry struck across the new work not far from No. 21 butt heading. All the work in No. 4 face was nearly completed. The pillars and stumps had been largely drawn and extensive caving had taken place. Yet through No. 15 butt and No. 4 face, broken and caved as the former was, many men reached the surface.

Shipp Holmes, a colored man, was followed by 15 men into the end of No. 8 face workings and thence along No. 15 butt outward. Holmes had an unextinguished safety lamp, but the other men were in the dark, and, so five men were parted from the rest and perished. When the Boss Driver Todd discovered that Holmes had managed to reach the surface by way of the far workings of No. 4 face, he made the trip back over the ground, and finding Edward Furlong and William McDonald, brought them out.

SOME INDIVIDUAL EXPERIENCES

Edward Furlong was a mule driver who worked in the 14th entry. Like other drivers, he collected cars from the room faces and delivered them near the mouth of the heading where it enters 8th face. From this place the cars were removed by a motor. He used an open lamp when driving down to No. 16 room. At that point he was in the habit of laying his open light down and then, taking the safety lamp in its place, would proceed down the heading.

At 12:15, on Wednesday, he was sitting at this No. 16 room, when the explosion occurred. It rolled him over a distance of about 12 ft. Picking himself up, he went to No. 8 face, and found all three face headings full of afterdamp. He tried to pass in the direction of the drift mouth but found the air terribly foul and remembering his deceased father's oft-repeated admonition, he decided



THE MINGO MANWAY, WHERE THE RESCUERS ENTERED THE MINE, A STEEP AND NARROW SLOPE

to go only half as far as he felt was safe so that retreat would be possible in case the air was too foul to permit his escape by the regular road. He went only a short distance and then returned to the mouth of the 14th butt entry and finally traveled as far down as butt entry 21. McDonald was with him and, as explained, he also escaped with the aid of Todd.

Many of the men were working in No. 4 face heading and the butt headings leading from it. These all escaped,

as did also some men, to the outby of the explosion. One man declared the explosion gave two distinct thuds. He was standing outside the mine foreman's shanty and after the explosion occurred he stepped inside and closed the door. As the foul air entered through the cracks around the door, he decided to leave and passed through a rear door to the intake and thence escaped.

#### TWO RESCUED AFTER 59 HOURS

The rescue of Charles R. Crall and Philip Legler aroused hope that many more men might be saved. They were located in butt entry No. 20 out of No. 8 face heading, after having been immured for about 59 hours. They were taken to the hospital, but they were soon in excellent condition and were permitted to go home. Like the other workers in the headings leading from No. 8 face they had retreated to the remote workings of the mine after the explosion, as the air in that direction was less contaminated.

In all, 96 men were killed either by shock, burning or suffocation. One man was completely decapitated, another had all the clothes burned from his body; on the other hand, some were found who had covered their heads with their coats to shut off the deadly fumes and had quietly lain down to die.

The ventilation of the mine is supplied by a Capell fan measuring 12 ft. in diameter, having a 6-ft. face and operated as an exhaust ventilator. It is driven by a continuous-current motor through gearing; this General Electric motor is rated at 525 hp. and has a speed of from 300 to 525 revolutions per minute.

#### SUGGESTED CAUSES OF THE EXPLOSION

It is early yet, before the mine inspectors have made their search and the inquest has been held, to suggest causes for the catastrophe. Some have assumed that gas entered from some of the many mines adjacent but now abandoned. The Buffalo and Garfield mines were both extensive. We show the old opening of the Buffalo mines, and the Champion or Murphy fan by which it was ven-



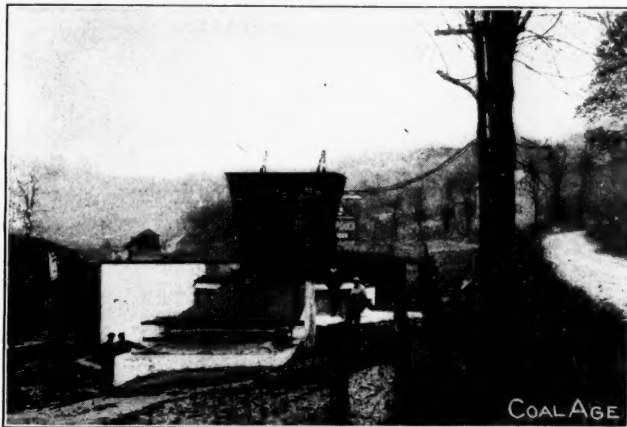
THE BLOCK OF HOUSES NEAR THE CINCINNATI MINE AND THE RIVER TIPPLE IN THE BACKGROUND

tilated. In 1883, James, the father of Edward Furlong, who was rescued, was foreman of this mine. It is thought that in some way the stoppings keeping back the gas from these old mines leaked out and filled the Cincinnati mine with firedamp.

There is also a disposition to blame near-by and abandoned gas wells for the catastrophe. It is said that at one time a machine cutter broke a hole into a well but fortunately no gas was found, so completely was the well exhausted or so tightly was it sealed. Some contend that

the restarting of entries 5 and 6 is blameable for the accident. Report has it that these headings were closed down for a while because of the presence of gas and reopened shortly before the explosion.

Alexander McCanch, the state mine inspector, made an investigation of the mine about six weeks before the accident and found it free of gas, but those who know the mine are disposed to think that an investigation is only



ELECTRICALLY DRIVEN MINE FAN. THE EXPLOSION DOORS IN THE FOREGROUND WERE BLOWN OPEN BUT THE FAN WAS UNINJURED

good for the period at which it is made, the gas generation being largely discontinuous and depending on working conditions.

#### THE MIXED-LIGHT SYSTEM

It may be interesting to recall the mixed-light methods of the Pittsburgh district as in existence at this Cincinnati mine, because the much discussed question of their propriety will probably be revived by this disaster.

Two butt headings are driven up side by side with crosscuts between them. These are numbered, we will suppose, 14 and 15. No rooms are turned from entry 15, but they are started in regular succession from entry 14, beginning near the mouth and extending inward. The air enters at entry 15, passes to the end of that heading as far as completed and returns by entry 14. As the rooms are driven up, the pillars are drawn back and gas escapes from the broken roof. No naked lights are allowed in those rooms where pillars are being drawn or in the part of the heading from which those rooms are started. The men who are driving rooms ahead enter their working places through entry 15 and pass into entry 14 through a small door in the crosscut next above the last room where pillars are being drawn. They are forbidden to travel down to the places where the pillars are in process of removal.

In regular turn with the rooms in entry 14 rooms are turned off entry 15. That is, when *all* the rooms in the first entry are turned, a room is started from the end of entry 15 and thereafter other rooms are opened and the pillars drawn proceeding outby and not inby; that is retreating, not advancing. Thus, as the air current still continues to follow its old course, the new rooms are still all on intaking air and the pillar-drawing rooms are reached by the current which has ventilated the new rooms.

# Mechanical Coal Picking

BY FRANK H. KNEELAND

**SYNOPSIS**—A description of two machines which give good results. The first can be attached to any ordinary shaking screen and removes the flat slate. The second picks slate of any shape, either flat or otherwise, and is used mostly upon chestnut or larger sizes of anthracite coal, although there appears to be no good reason why it should not work with equal success upon the bituminous coal in nut, egg or lump sizes.

The preparation of coal for market, especially if it be anthracite, by no means ends with its extraction from the tenacious embrace of Mother Earth. In order to successfully meet the requirements of the consumer, it must be properly graded as to size and free from impurities, such as slate and rock.

*K*, through a slot in the upper end of which passes the rod *L*, which is attached at one end to the hanger *C*. At an adjustable point on the rod *L* is placed the stop *M*, which comes in contact with the lever *K* only when the picker is in its extreme forward position.

The bottom plates of the picker are separated from each other by slots, the width of which depends upon the maximum thickness of the slate which is to be removed from the coal. This distance in each separate machine is slightly adjustable. The coal entering the picker from the receiving chute is easily jiggled forward across the plates. The slate on the other hand moves with greater difficulty and instead of progressing continuously forward, passes backward through the slots between the plates.

At the beginning of each rearward movement of the

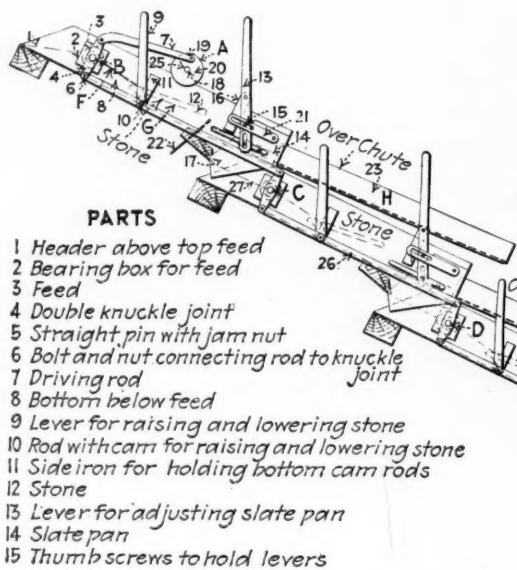


FIG. 2 GRAVITY SLATE PICKER

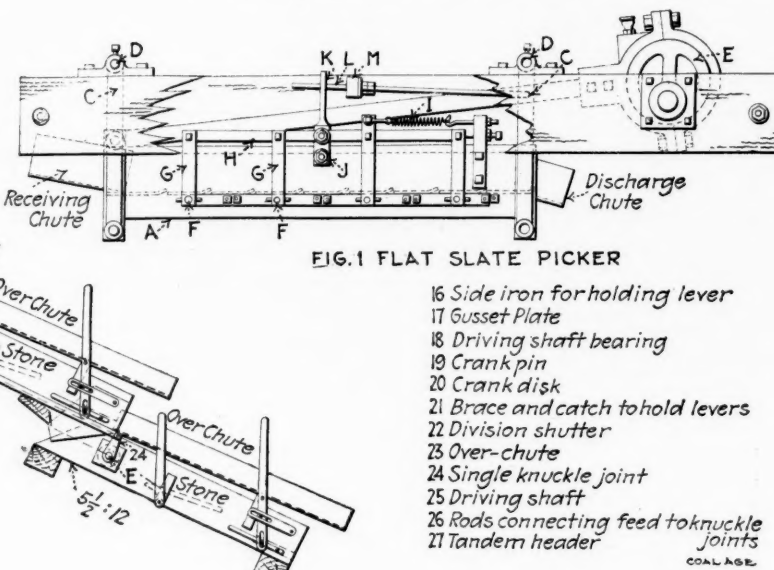


FIG. 1 FLAT SLATE PICKER

- PARTS**
- 1 Header above top feed
  - 2 Bearing box for feed
  - 3 Feed
  - 4 Double knuckle joint
  - 5 Straight pin with jam nut
  - 6 Bolt and nut connecting rod to knuckle joint
  - 7 Driving rod
  - 8 Bottom below feed
  - 9 Lever for raising and lowering stone
  - 10 Rod with cam for raising and lowering stone
  - 11 Side iron for holding bottom cam rods
  - 12 Stone
  - 13 Lever for adjusting slate pan
  - 14 Slate pan
  - 15 Thumb screws to hold levers

- 16 Side iron for holding lever
- 17 Gusset Plate
- 18 Driving shaft bearing
- 19 Crank pin
- 20 Crank disk
- 21 Brace and catch to hold levers
- 22 Division shutter
- 23 Over-chute
- 24 Single knuckle joint
- 25 Driving shaft
- 26 Rods connecting feed to knuckle joints
- 27 Tandem header

SIDE VIEW OF GRAVITY AND FLAT SLATE PICKERS. LIST OF PARTS REFERS TO GRAVITY PICKER ONLY

For many years, the final rock separation was accomplished by employing breaker boys to hand-pick the foreign matter from the coal, although it was clearly recognized that an efficient mechanical device for this purpose would prove not only a great convenience, but a great saving as well.

For a long time all attempts at mechanical picking proved failures. Recently, however, some such machines have been placed upon the market, one of the most successful of which, manufactured by F. H. Emery & Co., of Scranton, Penn., is herewith illustrated and described.

Fig. 1 shows a side view of a shaking picker, for the removal of flat slate. The framework *A* is suspended by four rods *C* from the points *D*, is free to oscillate backward and forward, and is driven by the eccentric *E*. Mounted in this framework *A* is a series of slightly bent transverse plates, every other one of which may be rocked slightly about the adjustable axes *F*. These axes are connected to the levers *G*, which are joined at their upper ends by the rod *H*. One lever is also connected to the spring *I*.

Pivoted at *J* and connected to the rod *H* is the lever

picker, the rocking plates are caused to move and slightly increase the opening or width of the slot by the lever *K*, coming in contact with stop *M*. It is impossible, therefore, for a piece of slate to become caught or jammed in these openings.

A careful inspection of the refuse discarded by this machine fails to show any appreciable amount of good coal, in fact, the ordinary operation of the picker leaves less than 2 per cent. of combustible matter in the refuse, while one-half of 1 per cent. is a result not infrequently achieved.

Another device manufactured by the same company and one whose field of usefulness is even broader than that of the machine above described, is what might be termed, a stationary slate picker. This is illustrated in Fig. 2.

The crank *A* is connected by a rod to the feeder *B*, and gives it a rocking motion. *B* in turn is connected through rods and levers to the similar feeders *C*, *D* and *E*.

These feeders are semi-cylindrical and in appearance resemble nothing so much as the valves of a Corliss engine. Their rocking movement within suitable seats al-

lows the coal to enter the separate stages or passes of the machine in intermittent batches, or "volleys."

From the feeder *B* the coal moves down the plate *F*, which is set at such an angle that the coal will slide readily. Upon reaching the stone slab *G*, its momentum is checked, but it is by no means brought to a standstill. The slate also is retarded through contact with the stone slab, but to a decidedly greater extent than is the coal. The result is that the clean coal reaches the lower edge of the slab at a higher velocity than the slate, and readily jumps an opening, into which the slate drops. Of course, some coal is retarded in crossing the slab by pieces of slate; this falls through the opening with the former and enters upon the second stage of the operation. The clean coal, which has jumped the opening above mentioned, is carried off by the over-chute *H*.

Four feeders and a like number of stages and slabs are provided in this machine, and by the time that the final slab is passed, the refuse falling through the last opening contains only about 5% of coal. This can be easily led

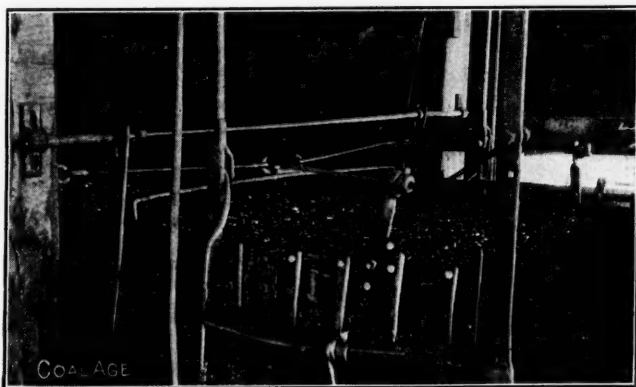


FIG. 3. FLAT SLATE PICKER IN OPERATION ATTACHED TO END OF SHAKING SCREEN

into a chute, where the coal may be removed by one breaker boy.

The above is the stationary picker in its simplest form. These machines can, however, be mounted in double or triple decks or in zig-zag form, depending upon the floor space and head-room available. Their work in any of the above types is practically uniform and identical.

The inclination of the various stages, as well as that of the stone slabs, will vary considerably, with different qualities and grades of coal. The width of the slot succeeding each slab is also important. Adjustments for these variations are made upon each machine.

A well known mine superintendent in the anthracite region, who has used these pickers for some time, makes the statement, that where he used to employ 40 boys to clean his coal, he now hires only 8, and if the head room in the breaker was sufficient to permit double decking of the machine, he would employ none at all, as he believes that a separation could be accomplished that would be so nearly perfect as not to warrant any hand picking whatever.

Although these machines are at present employed mostly in the preparation of anthracite, some are working successfully upon bituminous and there seems to be no good reason why it should not prove to be a cheap and efficient means of removing slate from practically all grades of this fuel, slack alone excepted.

## Efficient Screens

Two efficient screens for sizing and cleaning coal are illustrated below, both being made by the Hendrick Mfg. Co., Carbondale, Penn.

Fig. 1 is designed for use in ordinary oscillating screens and is known as "Perisertread" shaker plate. It has proven effective in the proper cleaning of the smaller sizes, the perforated steps placed every 12 in. eliminating the necessity of strips of wood, angles or other shapes

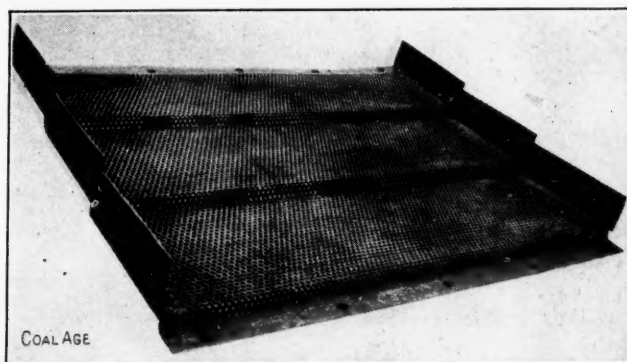


FIG. 1. STEP SCREEN WITH CIRCULAR PERFORATIONS

being fastened to the screening surface to hold back or retard the mass of material passing over the shaker at the sacrifice of considerable screening area.

The steps not only retard the coal, but they also act as tumblers, as at each thrust of the eccentric, the coal rolls over at these points, causing better separation.

The increased screening surface over that of flat plates amounts to about eight per cent., and this is placed at the point where most needed, i.e., at the spot where the coal is turned over.

Another advantage gained in this construction is the strengthening of the plate by the steps, they doing away with the buckling which often occurs with light plates perforated with small holes.

The flanged-lip screen (Fig. 2) is the last screen the coal should pass over before being loaded for shipment.

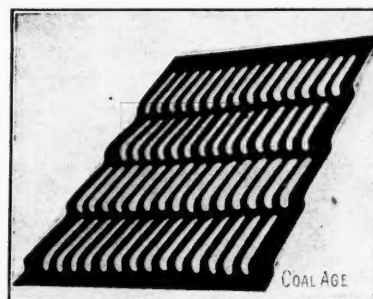


FIG. 2. STEP SCREEN FOR FINAL PREPARATION OF THE COAL

The slots are 12 in. long, wider at the bottom than at the top, with 1½ in. of the large end of slot flanged down at the lower end.

Where these screens are used in loading chutes, they can always be depended upon to reduce the percentage of rock and slate and under-sized materials in the product that has not been eliminated by the usual screening and sizing methods. They can be manufactured in any size and to suit all conditions.

# A Novel Screening Plant

BY W. F. SCHADEL\*

**SYNOPSIS**—The ordinary shaking screen, although admittedly efficient, has many objectionable characteristics, chief among which is its tendency to shake to pieces any structure within which it may be mounted. In the installation described this has been obviated by balancing the reciprocating parts and suspending them in a framework entirely independent of the mine tippie proper.

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In the early stages of coal mining the consumer would gladly accept coal in any condition and of any quality, it being even thus vastly superior to wood and other fuels. This state of affairs, however, has been constantly changing. The consumer has gradually become enlightened, educated to the difference between good and bad fuel, between coal well prepared and that carelessly loaded, until today the average purchaser, especially the steam-coal user, is as well or better informed on the merits of the different coals as the producer.

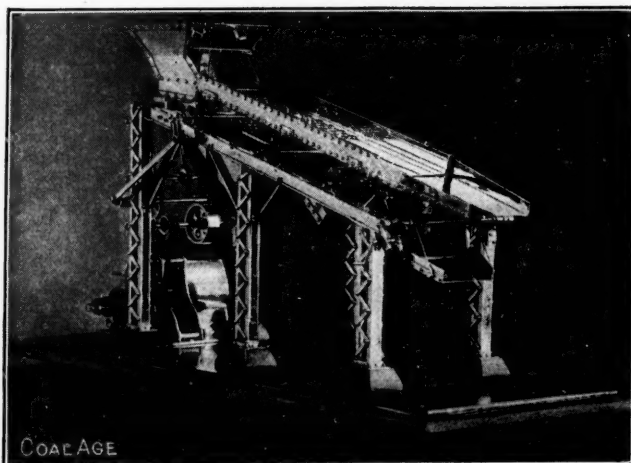
Science has taught the commercial coal consumer to test his fuel for heat value, city ordinances have compelled him to keep down the smoke nuisance, experience and his yearly balance have shown him which coal is the most economical to use and which gives the best results.

On the other hand, the domestic user perhaps does

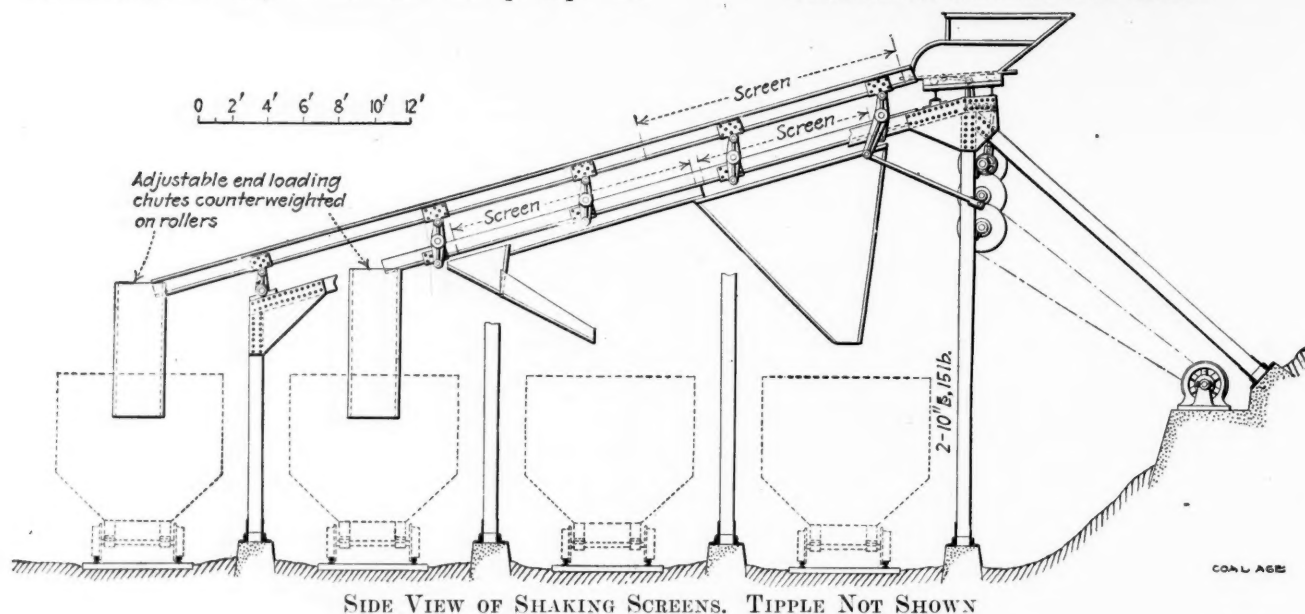
ing and rescreening have accordingly been tried out with more or less success.

## SHAKING SCREENS ARE MOST EFFICIENT

It is now generally conceded that the shaking screen is the most efficient means of grading coal, but the many



PHOTOGRAPH OF A WORKING MODEL



not go into the matter of heat value as scientifically as the producer of steam, but preparation is really of more importance to him than to the latter. The dealer must give him coal free from dirt and slack and if the shipper allows his product to go to the retailer in any other condition, it is the latter's loss, since he cannot sell dirt to his customers.

These conditions have caused a constant and increasing demand on the part of the trade for a better preparation of coal at the point of origin and have compelled the mine owner and operator to look to some means of improving the condition of the output. Various methods of screen-

difficulties encountered in the operation of this type of apparatus in its former crude state, have not only been expensive to those who have tried it, but have made others skeptical regarding something that they feared would be a constant source of annoyance and expense to them.

It is a well known fact that the old-style shaker, which is hung to the tippie frame, has a destructive tendency and has even shaken tipples to pieces in a few years or even months. Much trouble with eccentrics, screen connections, etc., has also been encountered, causing delays which have possibly cost the operator in a few days of waiting for repairs the price of an entire outfit.

To say the least, it is a difficult matter to install a substantial mechanical screening outfit on truly scientific

\*Wellston, Ohio.

principles in the ordinary lightly constructed, high-frame structure which is constantly deteriorating and being preyed upon by the various elements of destruction, so plentiful around a coal mine. These and other considerations have given the operator good grounds for being skeptical.

In order to overcome some of these difficulties, the Morrow Manufacturing Co., of Wellston, Ohio, have had their engineers at work for some time developing and perfecting an oscillating device which appears to have eliminated the most objectionable features of the old shaking screen and to have incorporated in its construction several features which adhere more closely to good practice in machine design. They are now installing for the Jewell Ridge Coal Corporation, at Tazewell, Va., a steel-frame self-contained shaker protected by a steel superstructure, which is entirely independent of the former.

The accompanying illustrations show the shaker which may be described as follows: The principal frame is of structural steel, the posts and top girders being built up of two 10-in. channels thoroughly tied together with steel lacing and gussets. The whole structure is well stayed laterally by angles and plates, and the principal longitudinal stiffening is effected by the two diagonal braces in the rear also built up of two 10-in. channels laced together, while the heavy double gussets also serve as bracing longitudinally.

#### HOW SHAKER IS FED

The receiving hopper is provided with a plate feeder, by means of which the coal is distributed evenly to the first screen of the apparatus. This feeder reciprocates on rollers at a speed of about 30 strokes per minute, and the feed is regulated by an adjustment which lengthens or shortens the travel of the plate. The upper and lower

screens have been provided with a novel means of mounting on double arms, so that they reciprocate in opposite directions, thus reducing vibration to a minimum.

The upper or lump screen is provided with 4 perforated steel plates, each 4x6 ft., giving 96 sq.ft. of screening surface, over which the lump coal must pass. The upper end of the lower screen is provided with 12x6 ft. of perforated plate, which screens out the slack and the lower end has 12x6 ft. of a larger mesh, through which the nut passes, and over which the egg coal is carried.

This arrangement gives ample screening surface for all sizes of coal, and the plates, being inserted in sections, can be removed and changed readily if an alteration in grade is desired. Bell cranks instead of eccentrics have been employed to drive the shaker arms, and the connecting rods are provided with adjustable brass bearings similar to those commonly used on the connecting rod of a steam engine. The angular position of the drive cranks in relation to the screens tends to further break up the direction of motion and thus reduce vibration.

The lump and egg tracks are provided with receding chutes, which compensate for the difference in height of the cars furnished by the railroad. These are so arranged that picking tables and loading booms can be added at any time if desired. The other two tracks are furnished with plain chutes to convey the coal from the screens to the cars.

This whole screening structure is covered with an entirely independent steel headhouse, to which there is no possible chance of transmitting vibration. The plate feed is provided with a friction clutch, controlled from the headhouse so that the coal supply can be shut off at any time without stopping the shaker. Furthermore, the apparatus is driven by a motor which sets on its own foundation on the ground.

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## Preparing Coal for the Coke Ovens

BY MILTON J. WILLIAMS\*

*SYNOPSIS*—Except in the immediate vicinity of Conellsville, coal must be crushed in order to make a good coke. The tendency in recent years has steadily been toward larger and heavier machines, which will handle more coal and produce a finer and more uniform pulverization.

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There has been a notable change in the size of coal employed in coke manufacture during the past decade and a half. Twelve or 15 years ago the byproduct oven was little known in this country, and those making coke in bee-hive ovens at that time seldom used crushers, taking their slack or screenings and charging the ovens with coarse coal. It was not long, however, before someone discovered that great losses were incurred in coking coal in this manner, and tried a crusher. This was the beginning of what is now an important step in almost every large coking operation.

#### THE FIRST CRUSHERS MADE COARSE COAL

The first crushers used, produced a product ranging from 1 in. down to dust. The results obtained were en-

couraging, but the crude crushers used were of light construction, gave much trouble, were inaccessible for renewal or repair of parts, could not be adjusted for fine or coarse work in the same machine, and were, generally speaking, unsatisfactory.

Enterprising operators therefore began to search for a more substantial pulverizing machine, and one that would produce a finer and more uniform product. Their theory was that if 1-in. lump and finer gave better results than run-of-mine, a product  $\frac{3}{4}$  in. or  $\frac{1}{2}$  in. and finer would give still better results.

About this time (1898) the Shawnee Coal & Coke Co., of Eckman, W. Va., secured from Milton F. Williams, of St. Louis, the first hammer crusher which he built. Within 18 months from the introduction of this machine there were in operation in West Virginia about 35 Williams' hammer crushers, most of these machines being equipped to crush to  $\frac{3}{4}$  in. and finer.

It was not long, however, until all of these crushers were equipped with new cages for  $\frac{1}{2}$ -in. to  $\frac{3}{8}$ -in. crushing, and all new machines were built with  $\frac{1}{2}$ -in. perforations. It is now seldom that coal for coking is crushed coarser than  $\frac{1}{4}$  inch.

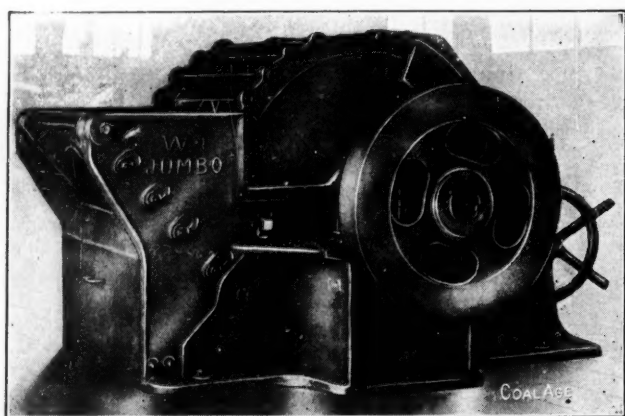
\*Old Colony Building, Chicago, Ill.

These operators found that by reducing the size of their coal they were able to produce more coke per oven, and improve its texture, making it hard and firm, something that could not be accomplished without thorough pulverization. Today in many localities in Virginia, West Virginia, Pennsylvania and other coking regions, even with the bee-hive ovens, the requirements are for a product through  $\frac{1}{8}$ -in. opening or finer.

#### BYPRODUCT OVENS REQUIRE FINE COAL

The coal required for byproduct ovens has always been quite fine. When the Hamilton-Otto Coke Co. installed their ovens about 10 years ago, they undertook to charge them with screenings and slack, but soon found that making coke in this manner was a decided failure, as the product when exposed to the elements for but a short time disintegrated and crumbled to such an extent that it had the appearance of crushed coke.

Crushing to  $\frac{1}{4}$  in. and finer gave better results, and it was not long until the byproduct operators all over this country were calling for from 70 to 90 per cent. through



WILLIAMS JUMBO CRUSHER. NOTE SUBSTANTIAL CONSTRUCTION

$\frac{1}{8}$ -in. openings, and this basis of fineness has prevailed for the past four or five years. There is, of course, no good reason why an operator cannot have a product 90 per cent. through  $\frac{1}{8}$ -in. openings at all times, but this means more expensive and careful attention to the crushers, as working under these conditions they must be adjusted frequently, and the coal must be reasonably dry for the best results.

Coking coal in byproduct ovens would be well nigh impossible were it not for the improved types of crushers. As for bee-hive ovens, many seams of coal are now coked, using slack and screenings. These are, however, practically all in the Connellsville region, where nature has been generous in that the product of the coal measures will produce a good coke without crushing.

#### INCREASE IN CAPACITY OF CRUSHERS

Almost all other coking coals must, however, be crushed, in order to secure a good coke. Hence mechanical means must be employed to offset nature's neglect in those seams outside the immediate vicinity of Connellsville. In coal crushing today, there seems to be a constantly increasing demand for greater capacities and heavier weights. Twelve to fifteen years ago a crusher with a capacity of 100 tons per hour through a  $\frac{1}{2}$ -in. openings was looked upon as

a large unit. At the present time, crushers with a capacity of 200 tons per hour through  $\frac{1}{8}$  in. are considered only medium size, and not until we reach a capacity of 300 to 400 tons per hour through  $\frac{1}{8}$ -in. openings is such a machine considered a large one.

In summing up the vast change that has taken place in the size of the product with which ovens are charged, it is evident that the crushing and sizing plant is one of the most important departments of any large coking operation. It is probable that many operators pay too little attention to the selection of the proper crushers as the increase in the percentage of coarse coal greatly affects the structure of the coke, and spoils many a charge that might have been a perfect product.

These conditions have been carefully studied with the result that crushers now manufactured and sold are, in most cases, machines weighing 10 to 20 tons, as compared with those of two to five tons made ten and fifteen years ago. Furthermore, the machines of today are equipped with adjustable hammers, cages and breaker plates to maintain the fineness and capacity.

If the coke operator would pay more attention to the selection of crushers, as important as this matter is to the success of his entire plant, he could save himself many thousands of dollars in equipment, reduce the amount of experimental work, and get results right from the start. Many corporation presidents, managers, superintendents, and purchasing agents have learned, however, that a crusher is an important and valuable piece of machinery and requires as much careful study and attention in installation as many other items about their plant that involve several times the outlay in money.

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### Germany's Coal Wealth

At the instance of the mining authorities at Bochnur, the coal deposits of the industrial districts of Right-Rhine and Westphalia have been carefully calculated. Within an area of 1532 sq.km. (about 591 sq.miles), which is now being worked, after deducting two billion tons as the amount already extracted, there remains to a depth of 1500 m. (4920 ft.) 32 billion tons of workable coal, while below the 1500-m. line there is estimated to be 10 billion tons additional.

A further area of 1728 sq.km., or about 666 sq.miles, has been opened by borings and is calculated to contain above a depth of 1500 m. a further 45 billion tons of coal. Finally, coal has been discovered in an additional area of about 2900 sq.km. (1120 sq.miles) through scattered borings, with the result that down to a depth of 1500 m. there are here deposits containing 18 billion tons, and at lower depths 151 billion tons.

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### Labor Conditions at Washington Mines

During the year 1912 the United Mine Workers of America organized local unions at the mines of the Carbon Coal & Clay Co., at Bayno, the Denny Renton Clay & Coal Co., at Taylor and Renton and the Puget Sound Traction Light & Power Co. (formerly the Seattle Electric Co.), at Renton. These companies, however, have refused to sign a contract with the union, and are either operating on the open-shop plan or have closed down.

# Methods and Machines for Cleaning Coal

BY A. LANGERFELD\*

**SYNOPSIS**—Classification of coals. Requirements in specifications for anthracite coal. Description of the different methods and machines that have been used for cleaning coal, particularly the anthracite-breaker methods and machinery. Improvements introduced to obtain a more perfect separation of coal from impure coal, bone, slate and rock. Detail description of the Langerfeld separator and recent improvements in the same. Cost of cleaning coal.

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After screening and sizing coal, most of it must be further cleaned to make it marketable. That means that if there are more than certain percentages of impure coal or stone mixed with the coal, the excess must be taken out to make the coal salable.

## CLASSIFICATION OF COALS

Coal containing less than 25 per cent. of carbon is commonly classed as "rock"; that containing from 25 to 40 per cent., "slate"; from 40 to 60 or 65 per cent., "bone"; while higher percentages of carbon pass for coal of varying quality. It is common to class all coal containing sulphur, rock or other impurities as "slate." "Good bone" is that containing from 50 to 60 or 65 per cent. of carbon, while "bad bone" contains from about 30 to 50 per cent. In chestnut and the larger sizes bad bone is usually classed as slate. It is generally understood that if there is 10 per cent. of actual slate in pea coal, there must not be over 15 per cent. of bone. The same applies to all the smaller sizes.

## SPECIFICATIONS FOR ANTHRACITE COAL

In the soft-coal regions the percentages of slate and bone allowed in marketable coal and the regular market sizes vary in different localities, but in the anthracite-coal fields of Pennsylvania, these percentages and market sizes are nearly uniform. The specifications for anthracite coal usually demand the following sizes: Steamboat, 5 to 8 in., must be all coal; lump, 4 to 6 in., must contain no slate and not over 1 per cent. of bone; broken or grate, 3 to 5 in., must not contain over 1 per cent. slate, or 2 per cent. bone; egg, 2 to 3 in., must not contain over 2 per cent. slate, or 2 per cent. bone; stove, 1½ to 2 in., must not contain over 3 per cent. slate, or 3 per cent. bone. In many specifications, however, 4 per cent. slate and 3 per cent. bone are stated as the limits allowed; but this may be a clerical error, as what was probably intended was 3 per cent. slate and 4 per cent. bone; chestnut, commonly called "nut," ¾ to 1½ in., must not contain over 5 per cent. slate, or 5 per cent. bone. In some specifications the slate and bone in this size is limited to nearly the same percentages as stove coal. Pea, formerly called "peanut" coal, ½ to ¾ in., must not contain over 10 per cent. slate. The percentage of bone allowed here is not usually stated, good bone being classed as coal and bad bone as slate. Buck, or buckwheat No. 1, ⅜ to ½ in., must not contain over 15 per cent. slate, and not too much bone. Some specifications provide that buck must not contain over 15 per cent. of pieces that will sink in a

liquid having a specific gravity of 1.7. This is a specific gravity test; often called the "acid test," because sulphuric acid was at first used as the liquid in which the tests were made. Rice, or buckwheat No. 2, ¼ to ⅜ in., is usually not limited in quality, because rice coal from breakers is always cleaner than buck; since the coal being more friable breaks to the smallest sizes in larger quantity than either slate or bone. Barley, about ⅛ to ¼ in. What is smaller than ⅛ or ⅜ in. is called gunpowder or culm, and is generally allowed to go to waste, although it is nearly pure coal. Some of this is now being made into briquettes.

Recently, much of the slate and bone that formerly went to the culm dump is being ground down to the smallest sizes, it is probable that these small sizes will also be limited in quality in new specifications. Besides, the three smallest sizes, called "steam" coal, in distinction from the larger "domestic" sizes, are now largely sold by their actual heat value. Pure anthracite produces 14,500 B.t.u. per pound.

## METHODS OF CLEANING COAL

There are seven different methods of cleaning coal, which are as follows: 1. Hand picking to remove the slate and bone. 2. Jigging. 3. Separation by frictional differentiation. 4. Separation by specific-gravity

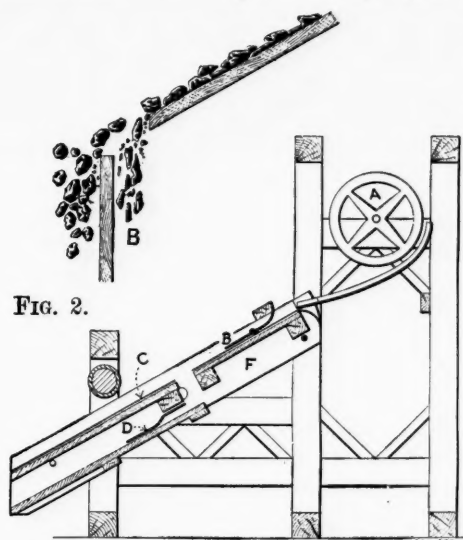


FIG. 1. THE FIRST THOMAS SEPARATOR

method. 5. Separation by washing. 6. Separation depending on the shape of the pieces. 7. Separation depending on difference in friability.

Formerly, all the cleaning of anthracite coal was done by hand picking, costing from 8 to 30c. per ton, according to size and quality. In 1911, there were 6607 boys and 3201 men employed in the anthracite breakers of Pennsylvania to pick slate. The picking of coal by hand resulted in a loss of from 6 to 12 per cent. of the coal mined, owing to the fact that much of the coal is covered with a slate-colored veneer or layer of charcoal-like material as thin as paper, which deceives the pickers. Also a large percentage of salable bone is thrown out and lost in hand

\*Mechanical engineer and industrial architect, Scranton, Penn.

picking. Thirty per cent. of good coal in the pickings usually represents about 9 per cent. of the coal mined.

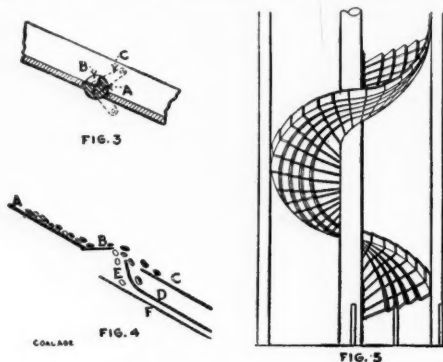
#### FIRST MACHINES WERE JIGS

Jigs of the most primitive construction were first used. These were gradually improved and a large number are still in use in anthracite breakers. The results obtained depend on the construction of the jig, the care with which it is attended, rate of feeding and the difference in the specific gravities of the coal, bone and slate. Some coals cannot be cleaned by jiggling, owing to the coal being nearly as heavy as the bone.

Jigs equipped with elevators cause a large loss of the best coal, often amounting to 7 per cent., as shown by actual tests. The coal is caught in the boots of the elevator and crushed. Besides, there is a considerable loss of coal in the slate, in jiggling. The expense in jiggling is materially increased by corrosion, owing to the water being acidified by the action of the impurities in the coal.

#### SEPARATION BY FRICTIONAL DIFFERENTIATION

This is the cheapest and most economical method of cleaning coal that has yet been found. It is based on the differences in friction between coal, bone, slate and rock, sliding on an inclined surface. Coal slides the quickest, bone next, slate next, and rock last, the friction of the rock on the inclined surface being greatest. By this method it is possible to separate the material into the following five classes: Coal, rough coal, called also "boney coal" or "good bone"; bone; "slaty coal" or "bad bone"; and rock. In the separation of anthracite coal, all but the clean coal, with its allowable percentage of bone and slate, are sent to the rolls to be broken to smaller sizes; except, of course, the rock, which is worthless and goes to the dump. The bone should be reduced one size smaller and the slate, two sizes smaller. Separators of this class are called "gravity pickers," because the coal slides down the



IMPROVEMENTS IN SEPARATORS

incline by gravity. It would be more correct to call them "frictional separators." Specific gravity also plays a part in frictional separation, sometimes aiding and sometimes counteracting the separation of the impurities from the coal.

#### THE THOMAS FRICTIONAL SEPARATOR

The first patent for a frictional coal separator was granted to Septimus Thomas, in 1875. Without going into unnecessary details, the important principle of this machine is illustrated in Fig. 1. The coal is fed into the chute from a revolving screen A, which is not a part of the separator. A stream of coal as wide as the machine

first passes under the apron B, the purpose of which is to prevent the tendency of the pieces to roll down the incline and start each piece to slide on the plane. As the different pieces of coal, bone, slate and rock have different velocities, they arrive at the opening above C at a different speed. The more swiftly sliding coal and bone jump this opening, while the slower-sliding slate and rock, for the most part, fall through the opening onto the lower chute F, which is provided with another apron D that serves the same purpose as the apron B in the chute above. In many separators of this kind that have been installed in the anthracite breakers, there are eight decks or chutes,

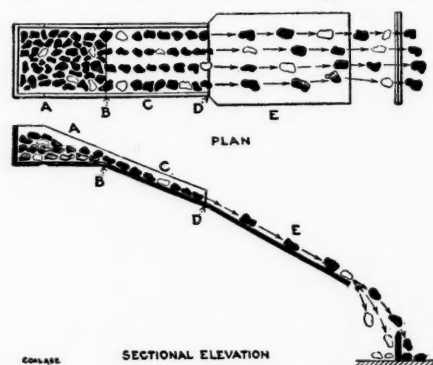


FIG. 6. DIAGRAM SHOWING FEATURES OF THE LANGERFELD SEPARATOR

one under the other, to provide a more thorough separation of the coal from its impurities.

A number of improvements were made on this machine, both by Thomas and others, from time to time. In place of the opening (Fig. 1), a vertical partition B (Fig. 2) was fixed slightly below and in front of the end of the inclined plane. As illustrated in Fig. 2, the more quickly sliding coal and bone would fall beyond this partition, while the slower-sliding slate and rock would fall on the rear side of the partition, causing a more or less imperfect separation. It was soon observed that the principal difficulty was that the different pieces interfered with each other on the sliding plane. A piece of coal sliding behind a piece of slate overtakes it and accelerates its speed, while the speed of the coal is retarded. To overcome this difficulty intermittent feeding was adopted, the material being fed onto the incline in dashes or small amounts. While this was an improvement, the separation was still unsatisfactory.

#### THE EMERY FEEDER

This improvement, in the manner of feeding the coal onto the incline plane, is shown in Fig. 3. It has been used in more breakers than any of the other improvements. It consists of a cylinder A, with a quarter section cut out, as shown at B. This cylinder was supported by two journals and rocked or turned to and fro, through a quarter of a revolution, by the arm C. This device provided a simple method of interrupting the flow of coal and produced good results.

In 1899, Caryl & Snyder introduced an important improvement, the principle of which is illustrated by the diagram, Fig. 4. The differentiating slide A terminated in a short apron B, inclined at such an angle as to give the material when it arrived at this point an upward direction. By thus throwing the pieces upward, the different flights or trajectories, resulting from the different

velocities of the material, caused them to separate more widely than before and made it possible to introduce two parters *C* and *D* beyond the opening. The lower deck or chute *D* was also provided with an apron *E*, inclined upward at its upper end. The swiftly flying coal was caught on the upper deck *C*, while the bone fell into the lower deck *D*. The slate and rock being the heaviest, and sliding more slowly, fell through the opening and was caught by the still lower deck *F*.

#### THE SPIRAL SEPARATOR

In 1899, a patent was granted to Pardee for the spiral separator (Fig. 5), which depends on the frictional principle. Many of these machines were installed and gave

for partly separating the larger sizes of anthracite coal. A patent for such a machine was granted to Phillips, in 1896, and later, to Ayers. The machines, however, have a small capacity, and are therefore not useful for the sizes made in large quantities.

#### THE LANGERFELD SEPARATOR

In 1903, a patent was granted to the writer for a frictional separator designed to overcome the defects in the Thomas picker, in such a manner as to give a positive separation. This separator contains several new features, one of the chief of which is that the pieces are fed onto the chutes separately and apart, as illustrated in Fig. 6, showing the chute in plan and sectional elevation. The

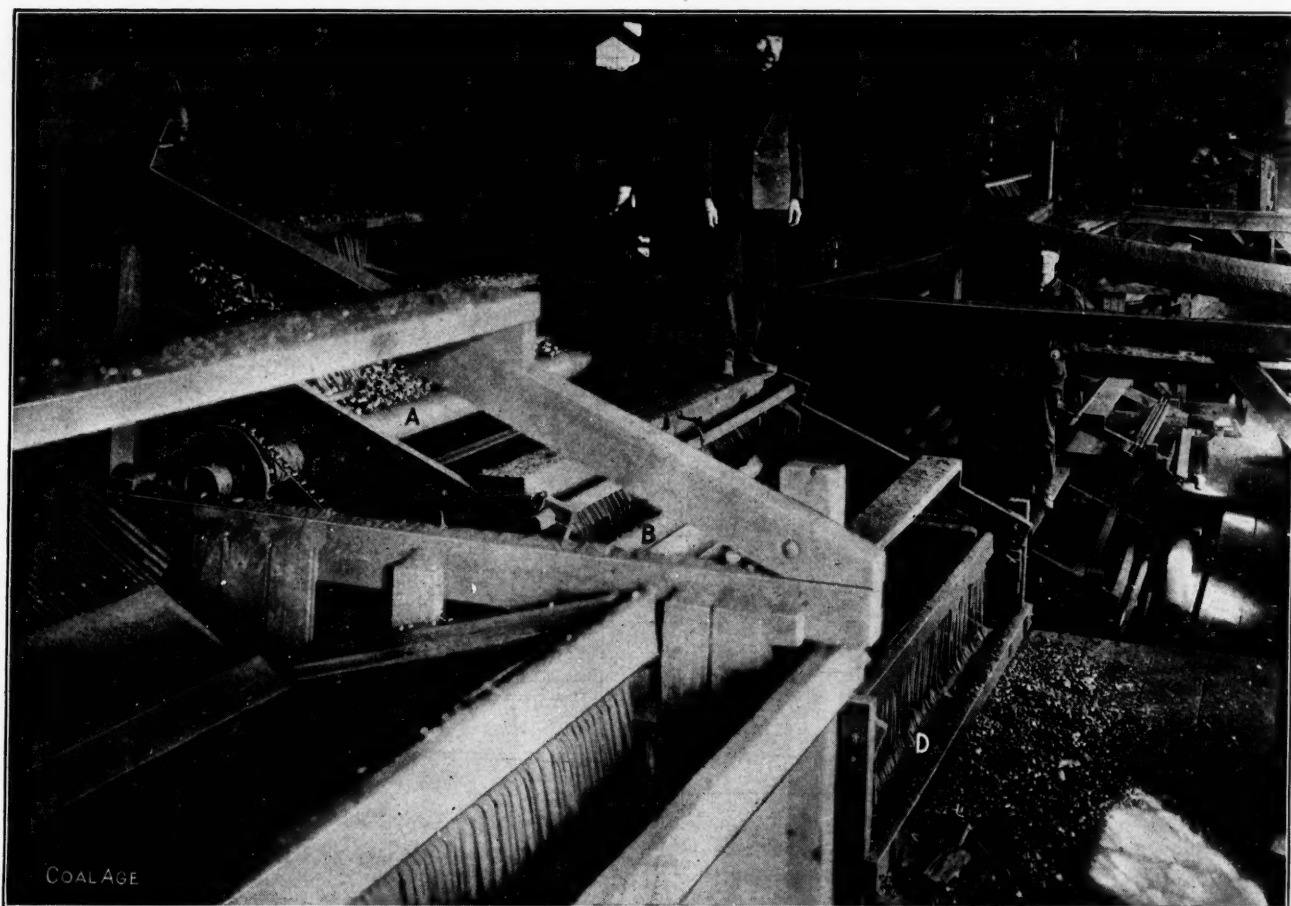


FIG. 7. SHOWING A SERIES OF SIX LANGERFELD SEPARATORS UNDER ONE ROOF

good results in some breakers, while in others they were almost useless. They have been lately used, to a large extent, for repicking the slate that comes from the Emery pickers. Later, an adjustable spiral was patented by Rice, by which the inward pitch of the spirals could be altered so as to afford a better separation in different coals. Unfortunately, in this type of apparatus, the centrifugal action developed tends to send the rock the wrong way. The bone and slate being heavier than the coal have a tendency to move outward from the center and mix with the coal when the spirals are dry and dusty, or when the bone or slate has smooth surfaces.

#### OTHER SEPARATORS

Separators have been designed with inclined moving surfaces, and some of these have been used to advantage

mixture of coal, bone, slate and rock, shown at *A*, is divided at *B*, in a manner to be described later, so that it passes onto the incline *C* in separate streams or files. In the diagram the coal is shown in solid black and the impurities in outline. At *D*, a single-piece feeder is so arranged that each piece is fed separately onto the chute *E*, as shown in the figure. This arrangement of feeding allows no collisions between the pieces and permits each piece to arrive at the end of the chute, or slide, with a velocity determined by its kind.

It is upon this principle of feeding chiefly that the success of the separator depends. The same principle is applied throughout the system. This feeding mechanism has recently been perfected in every detail, so as to give the required capacity. The quantity of coal that can be fed into a separator, in this manner, can be positively cal-

culated, by first ascertaining the number of pieces in a ton and then designing the machine to feed the required number of pieces a day. For example, the number of pieces in a ton of anthracite chestnut coal varies from 70,000 to 90,000, giving an average of 80,000 pieces per ton. The files of chestnut-size pieces, shown in sections *C* and *E*, Fig. 6, should be about 2 in. apart, and the pieces should be fed about 2 in. apart lengthwise or in the direction of slide. Experience has shown that from four to six pieces can be fed per second. The average run of coal of this size can be fed at the rate of six pieces per



FIG. 8. A PORTION OF A LANGERFELD SEPARATOR

second, but when the coal is very dirty, it has to be fed slower. This must be determined at the mine in question. But we may assume the average rate of feeding as five pieces per second.

In a thousand-ton breaker, the percentage of anthracite chestnut runs from 20 to 30 per cent., average 25 per cent., or 250 tons. Such breakers are usually built in two equal halves where the chestnut size is made, giving 125 tons of chestnut on each side of the breaker. In order to allow for delays and the subsequent rush of coal to make up for the time lost, it is necessary to calculate on 150 tons or better, 200 tons per day of, say nine hours; which gives an average of  $(200 \times 80,000) \div (9 \times 60 \times 60) = \text{say } 500$  pieces per second. Feeding at the rate of five pieces per second will then require 100 files in the feeder; and if these are 2 in. apart, the total feeding width must be 200 in. or nearly 17 ft. As this is an inconvenient width, the stream of coal is divided in half and two feeders, each 8 ft. wide, are used and have been found to give good results.

In Fig. 7 is shown a series of six Langerfeld separators under one roof. The construction of the separator is shown more in detail in Fig. 8, which represents one only of the series of separators. The coal first runs over a spreader that spreads it evenly from the width of the feed chute to the entire width of the machine, as shown above *A*, Fig. 8. A side elevation of the separator is shown in Fig. 9, while the movement of the coal through the separator is clearly illustrated by the diagram Fig. 10, which represents a vertical section through the several rolls, chutes and parters; and makes clear the separation of the several grades and qualities of material. The letters *A*, *B*, *C*, *D* refer to the same parts in Figs. 8 and 10, and

likewise *A* and *B*, in Fig. 9. After passing over the spreader, the material is divided into two nearly equal streams, by a stream parter, consisting of the roller *A* and the parter *X*, Fig. 10, parallel to the roller and under its front downward-turning face.

As shown in Fig. 10, the parter *X* divides the stream of coal so that about one-half, consisting of the thicker pieces, is carried forward and the other half, consisting mostly of the thinner pieces, is carried backward under the roller. This partial separation sends nearly all the rock forward and nearly all the slate backward. This

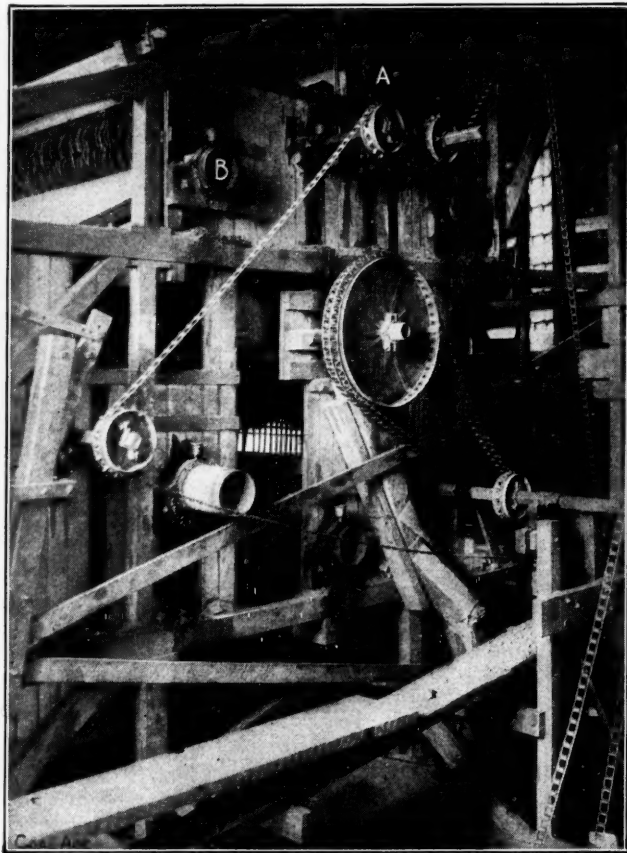


FIG. 9. SIDE VIEW OF STOVE-COAL SEPARATOR

separation is important as it facilitates the single-piece feeding that follows in each set, as illustrated in Fig. 10.

Leading to the top of each feed roller *B*, there is a channeled chute *E*, in which the pieces travel in files, as shown at *C* and *E*, Fig. 6. Above each roller *B* is a fringe of feeding fingers, which are clearly shown in Fig. 8. The purpose of these feeding fingers is to retard the movement of the pieces, separating them so that they are a certain distance apart, more or less, in each file or stream. The fingers are lifted each time a piece passes under it and drop back in time to catch the next following piece, so that no two pieces follow each other close enough to collide on the slide below the roller.

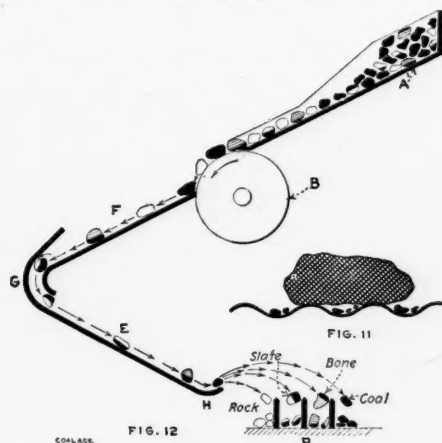
The channeled chute in each set is attached to a shaker *K*, Fig. 10. These shakers are perforated with small holes and let out the dirt and rub off much of the mud or particles that adhere to the moist pieces. The dirt falling into a hopper is carried away by a screw conveyor, shown at *V*, Fig. 10. From the roller *B* the material passes over the slide to the end *C*, from which it falls in a shower, as illustrated in the diagram, Fig.

10. These stream slides are made of corrugated soft steel or iron, as shown in Fig. 11. The advantage of this detail is that the coal is pulverized less and rides the ridges, as shown in Fig. 11, while the fine particles and dust slide down in the valleys between the ridges. The corrugations increase the efficiency of the slide very much over the old style of flat stone slab or plain steel. In these slides the coal and slate ride on the small particles and dust, with the result that the slate slides almost as quickly as the coal.

At the end *C* of the slide, the best coal has attained a velocity sufficient to send it over the parters *R*, Fig. 10, into the discharge chutes *D*. The purpose of the fringe *H* over these chutes is to prevent the breakage of the coal that has passed over the parter under a high velocity, which is reduced by the fringe sufficiently to avoid the breakage of the coal. The pieces that fall back of the parter pass down into another part of the machine designed for separating rough coal and bone from slate and rock. The construction shown in Fig. 12 is called an "inverter."

After passing over the roller *B*, in each set, and sliding down *F*, the pieces strike the inverter *G* that turns each piece over as it leaves the slide *F*, as illustrated in Fig. 12. There are many pieces that consist of a layer of slate or bone and a layer of coal. These are called capped pieces, and are classed as bone. They are apt to pass over with the coal if they slide on the coal side, and with the bone or slate if they slide on the other side; but the inverter makes the final separation of such pieces practically complete. Another advantage of the inverter is that it checks a rolling piece by acting to reverse its rotation, as shown in Fig. 12. When a piece rolls it moves faster than when sliding and may go to the wrong place. Again, the centrifugal action developed in passing the inverter causes the heavier pieces to rub harder against

for sizes larger than nut coal, the breakage of the coal is almost entirely prevented by giving the end plate a sidewise inclination, which causes the coal to slide to its proper place, instead of letting it fly or jump, as in the diagram, Fig. 12. This end plate is shown at *P*, Fig. 10. The end plate is warped or twisted so as to give the separation shown, the different materials sliding over the plate in the diverging curved lines indicated by the arrows. The parters *SS*, below the lower edge of this plate, carry the material to the proper places. These parters



DIAGRAMS SHOWING INVERTOR AND SECTION OF CHANNELED CHUTE

are made adjustable to regulate the separation according to the condition of the material. I omitted to mention that Fig. 9 is a side view of the stove-coal machines, located at each end of the series of separators shown in Fig. 7.

In a breaker, the run-of-mine coal usually comes so clean as to require but little cleaning after sizing. In such cases, separators can be speeded to nearly double their intended capacity. But in a washery, or in breakers where very dirty coal is to be cleaned, the machines should be run at their intended speed. No boys are employed to pick slate, in the breaker shown in Fig. 7; but the wages saved by using these machines is a small item in comparison to the saving of coal and decrease in expenses and losses incident to the recleaning of condemned coal. A carefully conducted test made at one of the breakers equipped in the old way, showed a loss of 30 per cent. of the market value, in a car of chestnut coal that was run through the breaker a second time.

#### AUTOMATIC REGULATION FOR DRY AND WET COAL

By the perfection recently made in another part of the machine, these separators are made automatic in separating runs that vary from dry to moist and wet coal; but the patents on this addition have not yet been issued. At the present time, these machines are set by means of a single lever, so as to separate dry, moist or wet runs. In breakers in which the run-of-mine changes in respect to being dry, moist, or wet, a runner is required to regulate the necessary changes. The regulation to which I refer is accomplished, at the present time, by moving the parters *RR*, Fig. 10, and the others in proportion, by suitable connections.

#### THE COST OF CLEANING COAL

The cost of cleaning coal by means of such machines as I have described is about 1c. per ton, which covers all

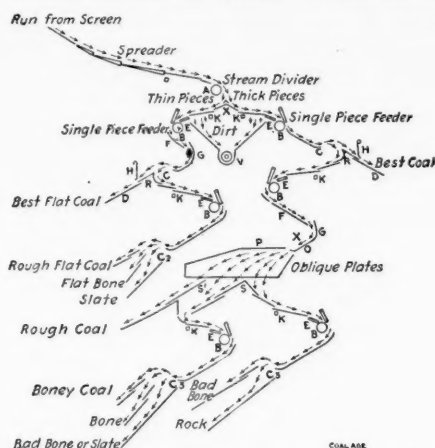


FIG. 10. DIAGRAM SHOWING COURSE OF COAL THROUGH BREAKER

the deflecting sheet and retards their motion, which action assists in their proper separation.

The lower end of the second slide *E* is curved upward, as shown at *H*, Fig. 12, and, as previously explained, this gives a greater divergence of the flying particles as they leave the chute, and makes possible a four-part separation; namely, coal, bone, slate and rock, by the insertion of three parters, as shown at *P*. In general, however, only a three-part separation is made in this part of the machine. In separators of this kind, designed

expenses, including the average cost of renewing worn-out parts, in a dry breaker. In a wet breaker, the internal wear of the parts is greater on account of the acidity of the water, to which I have previously referred, and which increases the cost of separation to  $1\frac{1}{2}$  or 2c. per ton.

#### SEPARATION BY SPECIFIC GRAVITY

The separation of coal by specific-gravity methods cannot be done commercially, in large quantities. It costs too much. This method is of use only for the separation of samples for tests. Such a separation is accomplished by immersing the material in a liquid that is heavier than coal and lighter than bone or slate. The cheapest liquid for this purpose is sulphuric acid properly diluted. A less dangerous liquid to use is a solution of chloride of zinc. The average specific gravity of anthracite coal may be taken as 1.45; but pieces exceeding 1.75 are classed as slate.

The separation of coal from slate and bone by washing was accomplished in English collieries, many years ago, in the same manner that gold is washed in troughs, or sluices, with riffles on the bottom of the sluices. Two such sluiceways were used; and when one was full of bone and slate, the run of coal and the flow of water were turned into the other one, while the first was being cleaned; and this process was repeated, successively.

A few years ago a machine was patented in this country for washing the steam sizes of anthracite coal by dropping a sheet of such coal into a flowing stream of water. The coal being lightest, was carried the farthest down stream, the bone next and the slate and rock last. Good results were obtained, but there was little use for the machines.

#### SEPARATION BY SHAPE OF PIECES

Separation depending on the shape of the pieces is too wasteful to be commercially useful, but, in most breakers, devices are used for separating flat pieces, because most of the slate is of that shape. There are, however, many flat pieces of coal as well as slate, and a further separation is necessary.

#### SEPARATION BY CRUSHING OF COAL

Soft coal is often cleaned by crushing, in such a way as to crush the coal without crushing the slate, bone and sulphur. In most cases, this is done by dropping the material in revolving perforated cylinders, the drop being of sufficient height to break the coal, but not the slate, bone or sulphur. The fine coal passes out through the perforations, and the refuse passes out at the open end of the cylinder. Another method is to pass the coal through hammer crushers so adjusted as to crush only the coal. This method cannot be used at the present time, for anthracite coal; because fine anthracite coal brings a much lower price than the larger sizes.

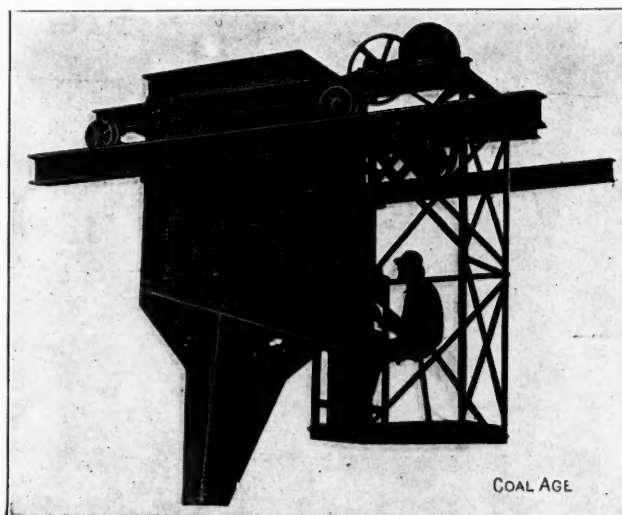
Knockers, or bumpers, are also used for cleaning soft coal. In this method, the coal is fed onto a slightly inclined plate near its middle. The plate is moved upward in the direction of its plane, slowly; then it is abruptly stopped and quickly moved in the opposite direction, which tends to move the slate upward on account of its greater weight, friction and momentum, while the coal moves downward. For anthracite coal, these machines would probably not be as economical as other separators, because there is considerably less difference in specific gravity between the anthracite coal and slate than there is between soft coal and slate.

## Flexible System for Boiler Coal

Motor-driven coal hoppers, which can take coal from bunkers located anywhere and deliver it to any boiler in a battery, are coming more and more into favor. Their use does away with the system of overhead bunkers and individual chutes for each boiler, and permits all the coal to be concentrated in one bunker instead of in a series of pockets.

The bunkers can be placed at one end of the boiler room, or, for that matter, outside the building if necessary, so that the steam-generating plant can be designed and located with greater freedom, and plenty of space can be left above the boilers for light and air.

This system is also frequently preferred to conveyors



TRAVELING HOPPER ON OVERHEAD TRACKWAY

because it is cleaner, less liable to break down, cheaper in first cost, and does away with the difficulty of taking care of the surplus or overflow which a conveyor will carry on to the end of the line after the intermediate discharge gates are closed.

The hopper runs on a trackway parallel to the front of the boilers and is controlled by an operator in the same manner as an overhead crane. Accurate scales on the hopper make it possible to keep a precise record of the fuel burned by any boiler. If desired, a recording device can be installed so that a printed record of the weight of every discharge can be made by the operator. The hopper runs under the bunker and is filled by the operator, the scales indicating when it is full. It is then run into the boiler room to deliver its contents wherever it is wanted.

These hoppers are manufactured by the Bergen Point Iron Works, Bayonne, N. J., and Westinghouse motors are ordinarily used to propel them.

33

The production figures of 1912 are being compiled as rapidly as possible and from reports already received it appears that the total output of Alabama mines will be well over 18,000,000 tons, which is approximately a 21 per cent. increase over 1911. This abnormal increase in coal consumption bespeaks the wonderful industrial progress now being made in Alabama and adjacent states. Many new mines are being opened with the expectation of getting a goodly supply of the coal business that will naturally develop in connection with the Panama Canal trade. If adequate shipping facilities are furnished, the year of 1913 will show a substantial increase over last year's production.

## WHO'S WHO—IN COAL MINING

It has been aptly said that some men can do business well. Others can do business very well. A few can do business superbly well. And there be found—at long intervals—an occasional one who can do business so completely well that he has distanced the bunch and stands alone in his chosen field. To this latter select class Francis Stuyvesant Peabody seems to belong.

Mr. Peabody was born at Chicago in 1859. His ancestors on one side of the family were Dutch, the other branch English, although the Peabody family has now passed the two-century mark in this country. And it is only fair to say in passing that he comes by the "Stuyvesant" legitimately, his mother belonging to one of the old Knickerbocker families.

After knocking about from "pillar to post" in various of the country's then meager educational institutes, he succeeded in capturing a sheepskin at the Sheffield Scientific School of Yale, in 1881. Thus equipped, he went through the customary painful disillusionment of the cub-graduate, waiting for the world to offer him a position, and finally "getting a job" as railroad messenger. Two years in various capacities as bank messenger and traveling salesman convinced young Peabody of the fallacy of getting rich on a salary; so in the year of 1883 we find him embarking in the coal trade, his sole assets being a team of white mules, an indifferent wagon and a well cultivated taste for cigarettes. But that he has now distanced the bunch and stands alone, even his most bitter rivals cheerfully concede.

To understand the man it is necessary to study the environment and conditions under which he waged his successful battle with life. It is a well known fact that most of the leaders in the coal industry today came up from the operating end, but Mr. Peabody is an exception in this respect, having made his *début* in trade circles. His broad knowledge of the producing end of the game has been acquired entirely in the hard school of practical experience; that he was an apt student one has only to compare the photo of his maiden effort, the "Old slope" mine (shown on next page) with any of the present-day efficient and high-powered Peabody operations.

The merciless competition which has characterized the past history of the coal business in Illinois does not seem to present a very inviting prospect. But when Frank

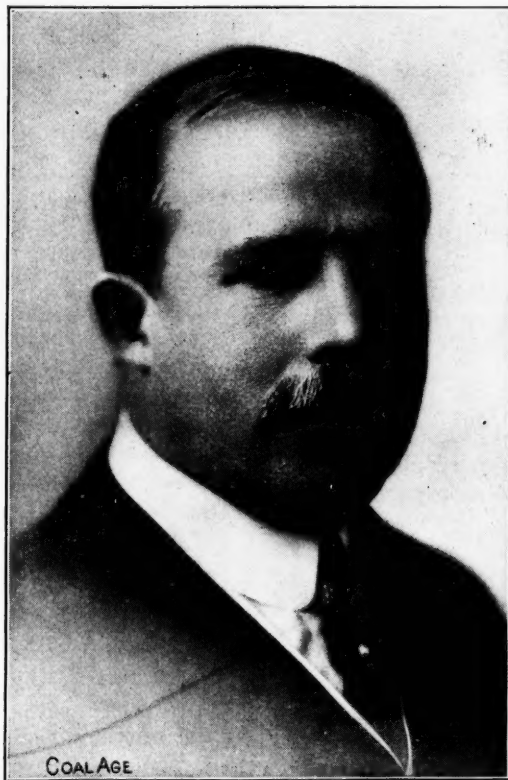
Peabody became a power in that field he performed a service for the industry that it can never repay. He brought together contending interests and abolished intrigue and secret methods of doing business that threatened ruin to the contending principals and effectually discredited the industry in financial circles.

Previous to this time price-wars of the most reckless sort were precipitated upon the slightest pretext, or no pretext at all, while the trade was surfeited with irresponsible adventurers and business integrity was rapidly diminishing into an unknown quantity. Obviously a legitimate enterprise could not exist in the face of such conditions, and it remained for Mr. Peabody to set up new standards and inculcate new principles into the trade. He attacked the job with his usual indomitable enthusiasm and gradually inaugurated a new era in the Chicago coal trade—rejuvenated it and gave it a new vigor and a new strength. One of the tangible evidences of his labors was the formation of an association which collected some two hundred thousand dollars in bad debts from scheming consumers and unscrupulous small dealers.

Frank Peabody is a radical optimist of the most pronounced type. We endeavored to impress him with the grave possibilities of labor's latent brute power of passivity. We

called his attention to the alarming prognostications of our most eminent authorities on economics regarding the concentration of enormous wealth that is being effected by the modern interlocking directorates. In fact we bombarded him with a perfect broadside of the subtle innuendos of the present-day alarmists, but without avail. In every case, he stoutly affirmed these were but temporary problems that would automatically solve themselves in due time and prove stepping-stones to higher and better things.

The coal industry itself knows the man as a consistent altruist and a conservation enthusiast. On his periodical visits to the mines he is more apt to inquire how Bill Jones was killed up in the Tenth North air course last month than why the cost of haulage on the Main West increased three cents. The humanitarian aspects of the mine-workers commands his first interest and he was among the first to adopt the modern slogan of "safety first." He regards the recent legislation in Illinois, pro-



FRANCIS STUYVESANT PEABODY

viding more comprehensive and effective safeguards for the miners as only the beginning of a broad general movement in that direction.

In the matter of conservation, he is inclined to shoulder the greatest responsibility on the consumer. He regards the meager percentage of efficiency obtained from burning the coal as the gravest menace to the principles of true conservation. While conceding that the mining companies are also wasting enormous tonnages, he believes that no concern can properly conserve its coal and remain solvent, without a broad comprehensive governmental regulation of the systems of mining. Even so he is of the opinion that the operators have materially benefited the conservation cause by educating the consumer up to using the finer grades of coal, which have in the past been



ruthlessly scattered along the highways to improve the roadbed.

In some respects the subject of our sketch differs from the usual type of self-made man who tends rigidly to business up to the last gasp and dies with his boots on. Thus we find that he insists on an annual pilgrimage abroad, is an ardent fisherman, an enthusiastic equestrian and as boastful of his presidency of the Hinsdale Golf Club as he is indifferent to like offices he holds in some of Chicago's powerful financial institutions. He is a member of many popular clubs. On the whole, Frank Peabody is a genial, hospitable personage who has a boundless liking for his fellowman and an innate courtesy so entirely unaffected that one is immediately impressed with its sincerity.

He credits his conspicuous success to an infinite capacity for hard work and a faculty of letting the other fellow do the worrying. The most casual observer, however, catches a gleam of other things behind the kindly brown eyes. An alert, questioning, appraising—in fact a “show me” look that makes you feel glad your business with him is legitimate business. It hints of a coldly impersonal and unbiased mind that has, perhaps, intuitively or subconsciously, proved his great mascot.

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### Paint Creek Strike at an End

The officials of the United Mines Workers of America have entered the country now under martial law along Paint, Cabin and Coal Creeks, by permission of Governor H. D. Hatfield. They are repared to instruct the mine workers to apply for their positions trusting in the assurances of the governor that the interpretation they put on the agreement will be accepted by the operators. The men have claimed that there was some ambiguity as to whether the adherents of the Union would be given an equal opportunity with others. There is no little rejoicing over the promising outlook for early peace.

### Miners Less Efficient

A mathematical demonstration of the decrease in the efficiency of anthracite miners in recent years has just been prepared from the figures in the last report of the Department of Mines of Pennsylvania. When the breakers are not running, it is useless for the miners to cut coal, and hence, the only way to arrive at a right and just estimate of their efficiency is to divide the annual output of the mines by the product of the number of miners employed and the number of breaker days. The result of this calculation was as follows:

Year	No. of Miners Employed	Average No. of Days Worked	Total Miners' Working Days	Output in Tons	Average Production per Miner per Day
1901.....	37,804	195	7,371,780	59,905,951	8.13
1902.....	36,392	116	4,221,472	36,911,549	8.74
1903.....	36,823	211	7,769,653	67,171,951	8.64
1904.....	39,848	213	8,487,624	65,709,258	7.74
1905.....	42,078	208	8,752,224	70,220,554	8.02
1906.....	41,801	206	8,611,006	64,410,277	7.48
1907.....	43,035	227	9,768,945	76,836,082	7.86
1908.....	44,340	211	9,355,740	74,592,181	7.97
1909.....	44,675	205	9,158,375	71,628,422	7.82
1910.....	43,651	212	9,254,012	74,717,852	8.07
1911.....	45,324	234	10,605,816	81,176,050	7.65

The variation of even a small fraction of a ton in the average production per day makes a tremendous difference on account of the great number of miners employed. As the variation in the above table is over a ton, it implies a decrease in efficiency of nearly 40,000 tons a day, when the highest and lowest figures are compared. This decrease in efficiency is attributed by James E. Roderick, chief of the Department of Mines, to the laxity with which miners' certificates have been issued by the Miners' Examining Boards to foreigners who cannot speak or understand English, and with whom the more intelligent and conscientious class of mine workers are unwilling to work as helpers for two years in order to qualify as miners themselves.

The great variation in the total number of working days also shows how costly to the mine workers are suspensions and strikes. In 1902, there were 3,150,308 fewer miners' working days than in the previous year. At the absurdly low estimate of \$2 a day, this cost the miners alone \$6,300,616. Since the miners form about a quarter of the total number of mine workers, the total loss in wages to all employees was approximately \$25,000,000.

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### Rolled Cast-Steel Flanges for High-Pressure Piping

The *Zeit. für Dampfkessel und Maschinenbetrieb* for Feb. 14 and 21, 1913, has the following in substance to say regarding the use of rolled cast-steel flanges for high-pressure piping: The welded-flange joint is always liable to produce local stresses at the weld, which may result in a lowering of the coefficient of safety of the plant. The rolled joint is both cheaper and safer. The cast-steel flange, when properly made and annealed, is much superior to wrought iron, but not every steel foundry can do such special work.

The tests made at the Royal Testing Laboratory at Gross-Lichterfelde, West., have shown the superiority of the cast-steel flange over other types. This superiority was due partly to the construction of the joint, which was a series of grooves and sharp-edged threads. By this means the working face between the pipe and the flange, owing to the softer material in the pipe, is made much larger than is the case with the usual construction.

## EDITORIALS

### The Flooding of a Mine in Illinois

On Apr. 6, the recent flood invaded the mine of the Gallatin Coal Co., and caused about \$25,000 of damage. The shaft lies near the Saline River at a village called Equality. The rising of the Ohio River flooded the Saline Valley and filled up the mine, where about 150 acres of 5-ft. coal has been taken out. After the water poured in, the compression of the air caused a remarkable phenomenon. According to some observers, the water spouted up from the shaft mouth to a height of 200 ft. Great difference of opinion exists as to the cause of this geyser-like action. We are conducting an inquiry into the cause of the strange occurrence.

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### Shall Labor Be Immune?

Mr. Gompers is making a persistent and determined effort to push through his bill providing exemption of the labor unions from restraint under the Sherman Act—a move which, it is strongly intimated, is regarded with favor by the President. The bill is being introduced in the form of a "rider," which immediately condemns it in the eyes of all honest men, since a just cause may stand on its own merits and does not have to be tucked under the skirts of a legitimate and necessary measure which our national assembly feels honor bound to enact.

Nor is this the most obnoxious feature of the case, as Mr. Gompers and his associates are seeking to accomplish their purpose by a miserable subterfuge, so transparent as to be at once obvious to all. That is, instead of openly and boldly demanding exemption from the Sherman Act, they are seeking to make it ineffective by forbidding the application of the regular funds to the prosecution of those cases wherein the labor unions are infringing upon it.

We have had a glaring example of the irresponsibility of organized labor in the numerous unjustified strikes in the anthracite fields, and it is to be hoped that our lawmakers will take cognizance of these incidents, and see fit to put the same check on labor as on capital. Mr. Taft vetoed a previous effort to put this bill through, and it will be interesting to note the attitude of our new administration on the question.

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### The Press of Pittsburgh

The press of Pittsburgh has ever been disposed to view the corporational activities in the environs of that city with friendly judgment. If it has failed to record the whole truth, the error in its verdict has been in smugness and complacency rather than in fierce and unrelenting criticism. The newspapers have almost never been disposed to break into the conscienceless condemnation so common in other cities, where corporations, good, bad and indifferent, are flayed with superlative criticism whether they do well or do ill. When the Pittsburgh Survey was

published, the press of Pittsburgh rose to a man and called the inquiry unholy and a travesty on the fair name of the city and its industries. In fact, the Pittsburghers are proud of their commercial supremacy and more jealous of the honor of their industrial captains than are the citizens of other municipalities, yet strange to say, the newspapers of Pittsburgh have, with remarkable unanimity, condemned the company operating the Cincinnati mine.

The mine, we must admit, does not justify the adage which declares that only model mines explode. The pictures accompanying our review of the disaster sufficiently bear witness to the fact that the mine at Courtney was not a show colliery. It is a relic of former years, and this fact is not disguised by the presence of electric machinery and an electrically-driven fan.

But apparently the mine was a better working proposition than exterior appearances would tend to make us admit. It has had for a generation a reasonably good record of freedom from accident. So there is no apparent cause for condemnation, and one is led to ask why the newspapers are disposed to take an unfair view. The answer is furnished by stating the untimely attitude of the company. In the year 1913, it is an anachronism for a corporation having an accident of such magnitude at a mine, to debar photographers and reporters and to decline to answer any fair and reasonable questions.

Met by the State Constabulary, forbidden to photograph the company's tipples and drift mouths from other points than the public roads, the reporter is naturally made sore and nettled. Refused information by the company officials, the newspaper man is driven to obtain his facts from parties whose misfortunes alone make them partial witnesses, even if these men of themselves are naturally honest and reliable in their statements. In fact, the inquirer almost inevitably drifts to the professional agitator, the loud-mouthed sorehead and the theorist who talks for the prominence thus obtained.

It is said that the company has the reports of the foremen and firebosses under lock and key, and other evidences of the condition of the mine are hard to find. The public is naturally suspicious; we think entirely without real reason but certainly not without occasion.

The railroads have long learned that openness in such cases pays and the Pittsburgh Coal Co. may also find it to its advantage to appoint someone to distribute reliable news to those desirous of obtaining it. The early declaration that the explosion was not severe surely has not profited the corporation a whit. The report, true or false, that it discouraged the Bureau of Mines from sending its rescue team has not made it popular. But of all its blunders the worst was its treatment of the press in the persons of a number of young reporters who were willing to do the company and the mishap at its mine more than even justice. Can these young men be blamed for thinking that some foul thing needs enshrouding? Why, otherwise, should the company cover it up so completely or guard it with such jealous circumspection?

## A Dangerous Bill

Although we have already called attention to the direful consequences to the coal industry of Ohio should the proposed "Green" bill become a law, we are pressed by the seriousness of the situation to again point out the dangers that will result from the enactment of such unfair legislation.

There seems to be little hope that the Miners' Union, which organization has fathered the bill, will reconsider its purpose and withdraw support of this hostile measure. It is to be hoped, therefore, that the citizens of Ohio will give careful thought to the proposed act before the bill becomes a law. Certainly, the experiences of other states, where laws have been enacted compelling the coal operator to pay the miner for his coal on a "mine-run" basis, should have some influence in the legislative course pursued by Ohio.

Careful investigation will show that in all states where the "run-of-mine" system has been adopted, the number of accidents has increased, and the price of domestic coal to the consumer has been raised. It is inevitable that when a miner is paid for his coal, irrespective of the size of the product, he will use an excessive amount of powder in shooting. As a result, the roof is shattered and the falls of slate and rock are more frequent.

Whatever affects coal mining in Ohio will have a similar affect on other great industries of the state. Should the "Green" bill become a law, coal mining in Ohio will be put back where it was half a generation ago. From the enviable position it now holds near the top of the list of progressive mining states, it will retrograde to a position among the few remaining states, where ill-advised legislation preserves a condition that causes the coal operators to be held up to ridicule.

The widespread effect of such an act by the legislature of Ohio can best be understood when it is stated that there are 648 mines operating in that state. The output of these mines last year was approximately 34,000,000 tons, having a value of more than \$35,000,000 at the mouth of the mines. Under the present agreement the miners are paid \$1 per ton for all coal that goes over a 1¼-in. screen. There is also an equivalent mine-run price of 71.4c. per ton. This, therefore, is a difference of 28.6c. per ton, which fully compensates the miner for the fine coal. As the agreement now stands, it is to the interest of the miner to send out clean coal. Under the new proposed act, he would be encouraged to load out whatever impurities the coal might contain, so that he could receive pay for it.

In the year 1883, this same question was extensively discussed in Ohio. A commission was appointed and the following conclusions were arrived at by the majority of this commission, after having taken testimony from miners and operators in practically every mining district of the state.

### CONCLUSIONS

From as fair and unprejudiced study of the testimony and the facts of the case as they were able to give, the commissioners agreed in the conclusions that if the payment of wages for mining was based on the weight of the coal sent out by the miner without consideration of its quality as to size, the plan would prove, for a time at least, prejudicial to the interests of both parties; to the operator by putting him to an inevitable disadvantage in the market, and to the miner by reducing or cutting off his work.

The claim that good miners would make the best possible good grades of coal because it is wisest for them to make

such grades, we do not find to be founded. The weight of at least indirect testimony is strictly opposed to this view. The claim that as a body they would mine their coal as large as possible from a motive of pride in doing their work well, or as one witness expressed it, "The operators could safely trust to the conscience and pride of the miners," in this respect we find to be of still less weight. It seems to us to be negated by experience and invalidated by the laws of human nature. Against the steady interest of self-interest in the way of relief from hard work, such motives do not hold their ground except in a small minority of cases.

Under the third and fourth heads, however, the present screen system fully sustains itself. It gives all due advantage to the skilled miner, and it proves itself in operation a thoroughly practicable working scheme. It is simple, intelligible and easy of execution. The fact that it has won its way against all competing systems to its present prominence goes far to show that the miners are not suffering injustice from its operation. A system essentially and innately unjust would not have been allowed by them to grow to its present proportions. A number of experienced miners testified that though the general sentiment of their body was opposed, they themselves considered the system a fair and satisfactory one.

In 1905 the Legislature of Arkansas passed a mine-run bill similar to the one now proposed in Ohio. A. H. Purdue, State Geologist of Arkansas, made a careful investigation of the matter, and we quote from his report as follows:

The proportion of fine coal increases unless the men have some incentive to do better work.

Thirty-five cents a ton is a conservative estimate of the decrease in value of the Arkansas coal as a result of the influence of the mine-run law.

The heavy shooting following the passage of the mine-run law has progressively increased the amount of rock falling in the rooms to triple that of 1905, prior to the law. It is, therefore, directly responsible for at least half the deaths due to this cause in 1908.

The estimate of the proportion of deaths due to the mine-run law is shown to be conservative by the fact that the number of deaths per million tons of coal mined has increased more than 40 per cent. since 1905.

The consumers suffer and are compelled to pay an increased price for coal of inferior quality.

The unfair treatment of the men who have spent their money developing the coal mines, the impairment of the value of the fuel supply of the state and its increase in price, will tend to discourage the investment of more money in industrial enterprises.

William Green, who introduced the bill, is a miner and was a few years ago president of the Ohio Miners' Organization. For two years he has been statistician of the United Mine Workers of America. Although he does not draw pay from the miners' union while the legislature is in session, we understand that his salary from the miners' organization will commence automatically upon adjournment, so that he is really an officer of the miners' union. He is president pro tem of the Senate, which fact gives him prestige in legislative matters.

The "Green" bill passed the Senate and went to the House of Representatives, where after two weeks' delay it passed by one vote. A few days later it was reconsidered and slightly amended. The bill is now in one of the committees and may or may not be brought up again at this session, which is about ready to adjourn.

There is no doubt whatever but that the only purpose of this measure on the part of the miners is to obtain a greater price for their labor with a less amount of work. To enact such a law would be unfair to every coal operator in the State of Ohio, since it will remove the only method by which he can make contracts with his employees. It will counteract effectively all plans designed to safeguard the lives of the miners, and strikes a destructive blow at our present popular ideas concerning the conservation of the nation's resources.

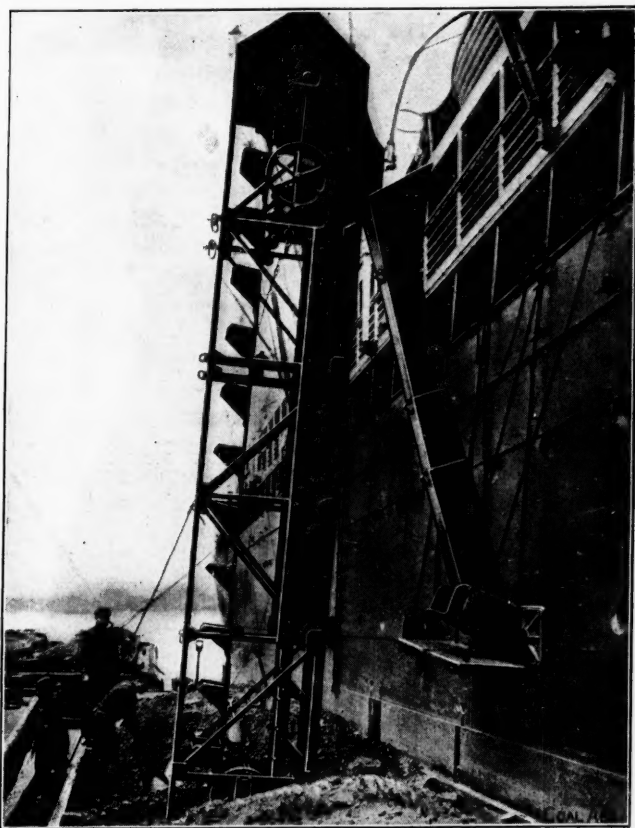
## Coaling Steamships

*SYNOPSIS—Description of a portable apparatus which can unload barges or vessels at a high rate of speed without employing numerous shovelers or trimmers.*

❖

One of the most modern and unique machines for coaling steamships is the De Mayo unloading elevator, manufactured by the Robins Conveying Belt Co., of New York.

This coal-handling device consists of a series of sheet-steel buckets of rugged construction, the backs of which form part of an endless steel belt. Between each two



THE DE MAYO UNLOADING ELEVATOR IN OPERATION

buckets is a steel plate of about the same height as the bucket itself, acting as a spacer. The buckets and the spacer plates are connected by hinged joints through which steel pins are passed the full width of the bucket and project at each end. At the upper and lower ends of the elevator are two cast-iron sprockets of special shape provided with teeth which engage the aforesaid pins.

The buckets are self-clearing by virtue of their special construction, so that the backs of the buckets as well as the intermediate plates act as a chute for conducting the coal or other material from the head sprockets into the telescopic chute. The entire machine is inclosed in a steel dust-proof casing and the motor is set at the head end inside the casing and is rendered accessible by doors in the housing.

The lower end of the casing is open, the corner angles forming four legs which sink into the material in the vessel. The machine is suspended from a boom or mast by a cable and its weight is allowed to rest on the material

to be dug. During the greater part of the operation the buckets are self-filling, although it is necessary to have a man or two near the elevator to help break down the pile and allow it to run toward the foot of the elevator.

Power is brought to the motor by a flexible cable from the dock or vessel being coaled. The average machine requires a 10-hp. motor and the larger sizes, which are some 40 ft. in length, require a 15-hp. motor. The smaller machines can deliver 75 tons per hour and the larger ones 100 tons per hour of steam coal.

Several steamship companies are now bunkering their coal under this arrangement. They state that it costs them considerably less and requires not more than one-third of the time necessitated by older methods. It also eliminates the dirt and dust, which are such a frightful nuisance in the coaling of passenger ships.

As compared with the above stated capacities of the machine, we will add that under the present or old method of coaling vessels by means of tubs, a gang of six or seven men with a tub is able to put only 15 tons of coal per hour into ports, to say nothing of the dirt involved and the loss of coal overboard.

Another great advantage of the machine is its flexibility. It can be hung and swung anywhere and easily raised and lowered to conform with the height of vessels or cargoes. In coaling steamships, it is generally customary to have four to six loaders on each side of the ship, which clean up the coal to the bottom of the barges; when this operation is completed, all of the machines are raised simultaneously, the barges are moved to a new position and the operation recommenced.

This machine is not only adapted for handling coal, but any sort of semi-hard material such as phosphate, sulphur, salt, etc. It can be used for loading from barges into vessels, from vessels into barges, or from railroad cars into bins. In fact its field of operation is quite extensive.

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### The Nitrogen in Coal

In his book on the "Carbonization of Coal," Vivian B. Lewes discusses the source of nitrogen in the fuel. He believes that not all of it is derived from the original vegetation.

In growing plants, small traces of nitrogen are found combined so as to form extremely stable compounds. Some plant forms contain more nitrogen than others, but as a rule 0.1 to 0.2 per cent. will represent fairly the amount present. Little nitrogen is disengaged as the vegetation changes into coal. Moreover the coal represents only a small fraction of the original deposit from which it was formed. These two facts suffice to explain why coal contains from 1 to 2 per cent. of nitrogen.

Peat, however, which is regarded by most authorities as an intermediate stage in the conversion of vegetable matter, often contains more nitrogen than is present in coal. While the highest percentage I have ever found in coal is 1.8 per cent., I have found 2.5 and even 3 per cent., in specially rich peats; so that it is probable that in its growth or decay, the sphagnum has a special power of directly absorbing and assimilating the nitrogen of the air.

## DISCUSSION BY READERS

### Education in Coal Mining

*Letter No. 8*—The value of education for the coal miner is strikingly illustrated by the careers of many men who have risen to high places of authority. The man in the mines who does not study may have no trouble in holding his job; but the man who acquires an education and learns about the job ahead of him is pretty sure to rise, provided of course that he possesses the proper moral qualifications. The direct money value of an education is evident. If a man is an inside laborer at \$2.62 per day, or a motorman at \$2.95, he can feel reasonably certain that if he earns his certificate he can secure a position as fireboss at about \$3.40, which is a rise of 30 per cent. and 15 per cent., respectively.

An education may be obtained by private study, and we are all familiar with notable examples of success due to this method being followed. There are, however, certain advantages in attending a mining class. In the first place, if one is enrolled in a class he is much more apt to advance faster in a given space of time. His class meetings are definite periods, in his weekly calendar, and he is a great deal more likely to attend them regularly than he is to sit down and study by himself with the same regularity. Also a properly conducted class will lead a man to study more systematically, as the instructor should be able to carry the work along definite lines, without allowing students to wander off into endless and profitless discussion.

In the class we are conducting, an effort is made to divide the work into three rather clearly defined groups, as follows:

1. Elementary branches—Arithmetic; spelling; grammar.
2. Bituminous mining law—Writing down sections from dictation; study of the outline of the state mining laws.
3. Mining Courses—Mine gases; ventilation; drainage; haulage.

Arithmetic is taught by means of problems that have appeared in state examination papers and also by problems based on requirements of the mining laws. The work in grammar is necessarily brief, consisting of a study of sentence and paragraph construction, with practice in the use of punctuation marks.

Great emphasis is given to the study of the mining law, both in the matter of helping each man to acquire a good working knowledge of the law, for the purpose of promoting greater safety in the mines; and also, because a man must be familiar with the law before he can expect to make a good showing in any state examination.

In the mining courses, by far the greatest attention is paid to the study of ventilation. Numerous problems illustrating the three laws of friction are worked out; and a close study is made of ventilating apparatus. The properties of mine gases are studied thoroughly, while many problems in percentage are worked out, in this connection.

Regarding the character of mining examinations, we feel that the unrestricted use of textbooks would be undesirable. It is better that a person acquire a sound knowledge of mining principles than that he become an adept in the use of the index of a mining pocketbook. However, since it is well nigh impossible to commit to memory the great mass of technical data and formulas that must be used, we believe that a certain portion or certain sessions of the examination might well be devoted exclusively to the solution of mathematical problems and in these, books should be allowed. This would form a good test of the candidates' ability to intelligently apply the formulas and constants required.

The whole question of the use of textbooks is, however, in my opinion, secondary to that of the practicability of the questions asked. The only fair and reasonable questions to be asked in examinations for certificates of competency to act as fireboss or mine foreman, are those that involve a knowledge of the regular work in the mine and the conditions that exist or may be met. All mathematical problems ought to be based on such actual work and conditions or on those that could easily occur.

M. D. COOPER, Mining Engineer,  
Ellsworth Collieries Co.

Ellsworth, Penn.

*Letter No. 9*—I am not in favor of the use of textbooks in examinations for certificates of competency in mining; because, if a person is anxious to pass the examination and receive a certificate for either of the following classes in Illinois: Mine manager (mine foreman), mine examiner (fireboss), hoisting engineer, or mine inspector, he should be willing to give a part of his time to preparing for the examination.

The average man can learn and retain the formulas necessary to pass successfully any of the above examinations, and I believe that the person who, after a great amount of study is successful in passing the same, without the aid of textbooks, will be a better man than the fellow who would pass by using textbooks. I feel like our good friend, Mr. Pickett, that when it comes to questions, the answering of which involves the use of sines, cosines, tangents, etc., they should be given with the question.

I believe that the use of textbooks in examination would give the advantage to the candidate who had received the most in the way of schooling, as they are more familiar with the use of books and in that way would pass the examination more readily than the candidate who had been deprived of the opportunity of the same amount of schooling. A man, after reaching the age prescribed by law, provided he had the practical experience necessary, could take the examination and with the use of textbooks make the grade required to pass. Unless there was a rigid oral examination, this man would pass with a better grade than another man, who perhaps had a great deal more experience than he and who would be a much safer man to employ as a mine manager.

I have known young men to appear for examination three or more times and make the written grade every time, because they had taken a high-school course; but they would fail in the oral or practical questions, which was the most important part of the examination.

I recall one instance of a miner, living in one of the southern counties of our state, and who came before the mining board to take the examination for certificate as mine manager. The first time he came he did very poorly in his written work and did not reach the oral part of the examination, although he had had a very large experience. Textbooks would have done him no good, because he would have been unable to apply the formulas had they been given him. He was not at all discouraged, because of his failure, but went home with a fixed determination to show the board that he could and would pass the examination. In less than two years he had reached the place where he did not need textbooks to pass the written grade and in the oral, or practical part of the examination, he had no trouble.

From my experience in connection with the work of the State Mining Board of Illinois, I believe that the use of textbooks in the examinations would be a mistake and should not be considered. What is worth having is surely worth the effort put forth to acquire.

MARTIN BOLT,

Chief Clerk, State Mining Board.

Springfield, Ill.

*Letter No. 10*—I welcome the opportunity of joining in this discussion. Education, in the line of the actual mining or digging of coal, consists partly of demonstrations by a miner who has learned by experience how to do the work. In like manner, a child learns how to draw a bucket of water from a well by watching the father or mother do the work. A boy learns how to pitch ball by watching another boy pitch and then improves his own pitching by practice. Few boys are actually shown how to pitch by professional baseball players. They must show some natural ability before the expert takes them in hand.

But the coal digger receives instructions from the official from the first day he commences work. Advice is given him in the undermining of coal and he is shown how to set timbers, drill a hole, etc. He is told what to do and what not to do, with a view to insuring his own safety and that of others. He then gains proficiency through practice. A knowledge of percentage, ratios or decimals would not assist him in this class of work. But if a man is a good coal digger and realizes the importance of study, a technical education in the science and principles of coal mining will make him no less capable as a coal digger.

The demand at the present day, however, should be for educated mine officials, and it will be time enough to think about the educated coal digger when more interest is taken in this demand. Many men who aspire to the position of mine foreman have held or are holding minor official positions, and we must deal with the education and examination of these men first. It is invariably the case that such men have forgotten most of the arithmetic they learned at school, and many unfortunately did not get much schooling as boys and are unable to intelligently express their knowledge of mining, in writing. They should be given first a grounding in elementary mathematics and after that they should study

mensuration, ventilation and gases, hydraulics, etc. At the same time they should attend lectures and be taught how to think clearly and quickly and how to commit the knowledge they have gained in the mine and at school, to paper. In their advanced studies, the planning of mine workings so as to concentrate operations and facilitate haulage and ventilation will prove most valuable to them when the time comes for the practical application of the knowledge gained at the mining school. But, unfortunately, the official still exists who scorns the mining school. He proclaims on every available occasion: "I am a practical miner, my school was the pit." The pit is a pretty good school, but the good pitman is like the good coal digger, he loses nothing by an education similar to the one mentioned at the beginning of this letter. In this age of science, strength of muscle is to strength of mind as burnt flax to beaten iron. The colliery official can spare the former but must possess the later.

The time is rapidly approaching when there will be a scarcity of officials possessing the necessary education. In states where laws have been suddenly passed demanding that all officials from the foreman down be certificated, it is found that men who wish to go to night schools range from 20 to 50 years of age, and but few young fellows between the ages of 14 and 24 desire to attend. It appears men generally get to be twenty and thirty years old before they realize what they have been losing. And it is indeed often pitiful to watch their struggles then. The mind is out of pitch and the man has lost all interest in study. He discovers that he is like a man who puts on skates for the first time. The solving of ordinary problems often looks hopeless to him.

What is the remedy for this condition? The progressive employer realizes the value of educated officials. Will an education boom do any good? The rescue helmet has had its boom, but it is a fact that as the number of educated officials increases, the need for rescue helmets will decrease. The education of the official is the first step to take to promote safety in mines, it produces better efficiency, and thereby more economy.

It is my opinion that mine foremen, assistant mine foremen and firebosses should not be allowed the use of textbooks at the examinations for this reason: If they know that such books will be available they will become mere copyists and will develop only slight independent mind faculties of their own. In their home work, they will rely upon the books and at the examinations will copy the text in addition to using the mathematical examples to aid them in working out problems. On the other hand, they will be put to a fair test if they are given the more intricate mathematical formulas embodied in the examination papers, but printed on a separate sheet. At the examinations for mine superintendents or higher mine officials and state mine inspectors, formulas should not be given, and certainly no textbooks allowed. A candidate who passes an examination where books are allowed gives no proof of his ability to efficiently fill the position. It is regrettable that it is not customary to require that mine superintendents stand a severe examination.

I am not overlooking the fact that education does not enable all mining men to become capable officials. An education does not always produce that trait called executive ability, nor does it always supply a man with the necessary moral backbone. But the aspirant can console

himself with this truth; that the mine official of the future will, to a certain extent, be educated.

College education does not always produce capable men; but the *system* that is drilled into them at college goes far to produce that result. Where a man stays at college until he reaches the twenties, it is not surprising that, in a mine, he will often appear like a fish out of water. The college education that is likely to produce the best results is the "sandwich system." Under this arrangement the student is at college for six months of each year and the remaining portion of the year is spent underground and in the workshops on the surface.

SAMUEL DEAN.

Delagua, Colo.

## Legislation to Regulate Timbering

I was pleased to note the great interest that was manifested by those who took part in the discussion of mine timbering. I notice, however, that some of those who discussed this question thought that no "hard and fast" rule could be laid down to regulate methods of timbering in coal mines. I believe, on the contrary, that such a conclusion is wrong, and that legislation is greatly needed to regulate the question of timbering, in coal mining.

I do not want to be considered as radical when I say that I believe thoroughly in "hard and fast" rules, in

mining. In support of this statement I will point out a few facts that must be evident to every mining man.

First, consider what is meant by a new mining law. It is an attempt to compel mining men to abide by a "hard and fast" rule. For example, in the operation of a gaseous mine, where it is necessary to use safety lamps, mining laws require that all tobacco pipes and matches shall be left outside. Men using safety lamps are compelled by law to keep them at a safe distance from the swing of their pick, where they will not be liable to injury or accident. There are laws regulating ventilation, explosives, and the use and handling of the same, and the manner of mining and shooting coal. In some instances, the law specifies how timbers shall be set.

Everyone of these laws is a "hard and fast" rule. In my opinion, there should be such a "hard and fast" rule regulating the maximum distance at which timbers should be set apart. The suggestion has been made to employ a timberman to set timbers. In Durham, England, this was done and the cost deducted from the price of mining. In this country, this would undoubtedly give rise to trouble. I am a firm believer in systematic timbering and am convinced that this would go far toward reducing the number of accidents at the working face.

WM. CROOKS,  
Mine Foreman.

Quinton, Ala.

# Study Course in Coal Mining

BY J. T. BEARD

## The Coal Age Pocket Book

### ARITHMETIC

Arithmetic is the science of numbers. Numbers are used to express magnitude or quantity; as two, three, or four feet; two, three, or four apples; etc.

A unit is a single thing; as one foot, one apple, etc. One is the unit and foot or apple tells the kind. Numbers are used to express how many units are taken; as two feet means two units of one kind; three apples are three units of a kind.

**The Digits and Cipher**—There are ten characters used to express number, and by arranging these in certain ways, according to certain rules, it is possible to express any reasonable number or quantity. These ten characters are given below with their names and the spots or balls under each shows the number of units that character represents. The first character is called a "cipher" and is used to indicate no units. The remaining nine characters are called "digits."

Cipher	One	Two	Three	Four	Five	Six	Seven	Eight	Nine
0	1	2	3	4	5	6	7	8	9
•	•	•	•	•	•	•	•	•	•
		•	•	•	•	•	•	•	•
			•	•	•	•	•	•	•
				•	•	•	•	•	•
					•	•	•	•	•
						•	•	•	•
							•	•	•
								•	•
									•

**Expressing Larger Numbers**—To express numbers greater than 9, which is the highest digit, it is necessary to begin and count these same digits over again. This gives a series of digits or counts, and the number of the series is written before the cipher or digit, after the first series, as follows:

First series,	0	1	2	3	4	5	6	7	8	9	units
Second series	10	11	12	13	14	15	16	17	18	19	teens
Third series,	20	21	22	23	24	25	26	27	28	29	twenties
Fourth series,	30	31	32	33	34	35	36	37	38	39	thirties
Fifth series,	40	41	42	43	44	45	46	47	48	49	forties
Sixth series,	50	51	52	53	54	55	56	57	58	59	fifties
Seventh series,	60	61	62	63	64	65	66	67	68	69	sixties
Eighth series,	70	71	72	73	74	75	76	77	78	79	seventies
Ninth series,	80	81	82	83	84	85	86	87	88	89	eighties
Tenth series,	90	91	92	93	94	95	96	97	98	99	nineties

## The Coal Age Pocket Book

**Notation**—The names of the first series of numbers have been given. The second series is called the "teens"; because, in this series, the names of most of the numbers end in "teen." The naming, in this series, is a little irregular; it is as follows:

Ten 10, eleven 11, twelve 12, thirteen 13, fourteen 14, fifteen 15, sixteen 16, seventeen 17, eighteen 18, nineteen 19.

The numbers in each of the following series are named by writing the name of the series before the name of the digit and the cipher always taking the name of the series; thus, for the third series: Twenty (20), twenty one (21), twenty two (22), twenty three (23), etc.; and for the fourth series, likewise, thirty (30), thirty one (31), thirty two (32), etc., and so on throughout the ten series, the last number of the tenth series being ninety nine (99).

Beyond the tenth series, it is necessary to use another figure. Instead of two figures, three are now required to express a number, and a new period of ten series is started, which is the same as that just explained, except the figure one (1) precedes the other two figures of each number, to indicate this period. As before, the period has ten series.

One-hundred period	First series,	100	101	102	103	104	105	106	107	108	109
	Second series,	110	111	112	113	114	115	116	117	118	119
	Third series,	120	121	122	etc.						
	Fourth series,	130	131	etc.							
	Fifth series,	140	etc.								
	Sixth series,	150	etc.								
	Seventh series,	160	etc.								
	Eighth series,	170	etc.								
	Ninth series,	180	etc.								
	Tenth series,	190	etc.								199

There are evidently nine of these "hundreds" periods, corresponding to the nine digits, each of which, in turn, precedes the other two figures, as shown above. For example, the two-hundred period runs: Two hundred (200), two hundred and one (201), two hundred and two (202), etc., etc., to two hundred and ninety nine (299). Then follow, in turn, the three-hundred (300) period, four-hundred (400) period, etc., to the last period of the hundreds group, or the nine-hundred (900) period; the last number of this period being nine hundred and ninety nine (999).

Beyond this point, it is necessary to use four figures instead of three. This forms a new group of nine periods, called the "thousands" group or periods. As before, the nine digits, respectively and in turn, precede the other three figures, in each number of the group, which runs from one thousand (1,000), one thousand and one (1,001), one thousand and two (1,002), etc., etc., to nine thousand nine hundred and ninety nine (9,999).

Following this is the ten-thousand (10,000) group of five figures in each number and the hundred-thousand (100,000) group of six figures. Then comes millions, 7 figures; tens of millions, 8 figures; hundreds of millions, 9 figures. For example:

One hundred and sixty five million, two hundred and three thousand, six hundred and seventy nine... 165,203,679  
Twenty million, four thousand, and six..... 20,004,006

## EXAMINATION QUESTIONS

### Mine Foremen's Examination, Northwestern Improvement Co., Roslyn, Wash.

(Selected Questions)

**Ques.**—What constitutes the make-up of a good mine foreman? What are his duties? What should be his first consideration; second consideration; third consideration?

**Ans.**—The principal qualifications of a good mine foreman are a wide experience and knowledge of mining in all its branches; a good judgment of mining conditions; a thorough knowledge of the mine of which he has charge; ability to handle men; skill in directing others and planning the work so as to accomplish the greatest results in the least time and at the smallest expense. A mine foreman must be fearless, firm, fair, just and considerate in all his dealings; a good judge of human nature and of what constitutes a day's work. He must be patient, industrious and sober.

It is the duty of the mine foreman to devote his entire time to the operations of the mine. He must superintend every detail of the work, either personally or through his assistants, and should, as far as possible, visit every working place at least every alternate day when the mine is working. He must inspect all machinery and appliances to see that they are in safe condition, giving particular attention to the ventilation and the drainage of the mine. He must inspect all airways, haulage roads and travelingways and remove all dangers found or that are reported to him, permitting no men to work in such places until the same are made safe. He must provide the needed supplies of timber and other material and must see that the mining laws and mine regulations are strictly obeyed.

The first and most important consideration is the safety of the men in his charge; second, the security and preservation of the property; third, the economical extraction of the coal so as to avoid undue loss and expense.

**Ques.**—If the safety lamp gives no indication of the presence of gas, is this fact proof that the atmosphere is safe to enter?

**Ans.**—No. The mine air may still contain poisonous gases in sufficient quantity to be dangerous or fatal to life. Air containing one-half of 1 per cent. of carbon monoxide gas may prove fatal to life in a short time. The presence of this gas would not be indicated by the safety lamp; but a caged mouse or bird, if carried into such an atmosphere, would betray by its actions that the air was not safe to breathe. These small animals are affected by the poisonous gases in much less time than is required to affect the human system.

**Ques.**—How would you proceed to remove firedamp (afterdamp?) from a section of a mine, after an explosion? What dangers would you expect and how would you overcome them?

**Ans.**—The removal of noxious or dangerous gases from a section of a mine, after an explosion, will depend on the

conditions that exist in the mine. In general, the work must be conducted by first removing all men from the mine except those engaged in the work. Reliable men should be stationed at each approach to the return airway, leading from the affected section to prevent anyone from entering the return-air current. Only safety lamps should be used. The circulation of air should then be increased in that section of the mine, as much as possible, either by speeding the fan or by such a regulation of the air current as to supply a larger quantity of air to that particular section. The work must be performed on the intake side and its progress carefully watched, by making the necessary tests of the air, from time to time. Wherever necessary, temporary brattices should be erected so as to deflect the air current in such a manner as to sweep out the accumulated gases from the workings. In all cases, sufficient time should be given for the air to act upon the gases, diluting and removing them from their lodging places. Due precaution should be taken against unexpected roof falls driving the gas out upon the lamps of the workmen.

**Ques.**—An airway is 10 ft. 5 in. wide and 6 ft. 9 in. high; find the area of the airway. If the velocity of the air current is 450 ft. per min., what quantity of air is passing per minute in this airway?

**Ans.**—The sectional area of the airway is found as follows: 10 ft. 5 in. = 10.41 ft.; 6 ft. 9 in. = 6.75 ft. The sectional area is then  $10.41 \times 6.75 = 70.27$  sq.ft., nearly. The quantity of air in circulation is then

$$Q = av = 70.27 \times 450 = \text{say } 31,620 \text{ cu.ft.}$$

**Ques.**—The quantity of air passing in an airway is 120,000 cu.ft. per min., and the water gage produced is 2 in.; what are the units of work performed each minute and the horsepower producing the circulation in the airway?

**Ans.**—A water gage of 2 in. corresponds to a pressure on the air of  $2 \times 5.2 = 10.4$  lb. per sq.ft. The work performed each minute, or the power on the air, is found by multiplying the quantity of air in circulation by the pressure in pounds per square foot. Thus,

$$U = Qp = 120,000 \times 10.4 = 1,248,000 \text{ ft.-lb.}$$

The horsepower producing the circulation is the effective horsepower or the horsepower on the air, which is  $1,248,000 \div 33,000 = 37.8$  hp.

**Ques.**—A slope is 2600 ft. long, measured on a pitch of 30 deg.; what will be the horizontal distance, and what is the vertical height of the slope? What is the pressure on a pump pumping water from the bottom of this slope, disregarding the pipe friction?

**Ans.**—The horizontal distance, or horizontal length of this slope is

$$2600 \times \cos 30^\circ = 2600 \times 0.866 = 2251.6 \text{ ft.}$$

The corresponding vertical height of the slope is

$$2600 \times \sin 30^\circ = 2600 \times 0.5 = 1300 \text{ ft.}$$

Since the water pressure due to a foot of vertical height is 0.434 lb. per sq.in., the pressure exerted on this pump is  $1300 \times 0.434 = 564.2$  lb. per sq.in.

## COAL AND COKE NEWS

### Washington, D. C.

Representative Hamlin has introduced a bill (Apr. 23) to prohibit the interstate shipment or attempted shipment of convict-made goods, or products of mines in which convict labor is employed.

The bill requires that "no carrier of interstate commerce shall knowingly transport or accept for transportation any goods, wares or other articles of merchandise manufactured in whole or in part by convict labor, or knowingly transport or accept for transportation the products of any mine or factory in which convicts are employed or permitted to work, and which goods, wares or other articles of merchandise or products of mines are to be carried to any point in any state, district or territory of the United States outside of the state where produced or mined and each separate shipment prohibited herein shall constitute a separate and distinct offense."

The bill further provides that any agent of any interstate carrier who violates the law shall be adjudged guilty of a misdemeanor punishable by a fine of not less than \$1000 or by imprisonment not to exceed six months. Furthermore the bill requires that "it shall be unlawful for any person, firm or corporation—to ship, attempt to ship or offer for shipment to any interstate carrier any goods, wares or other merchandise, or products of any mines—produced or manufactured wholly or in part by convict labor to any point in any district territory or state in the United States outside the state where such goods, wares or other merchandise or products of mines are made or produced." The same penalties are made to apply in this case as in the case of the violation of the earlier provisions of the measure.

Senator Crawford has introduced a bill which has been referred to the Committee on Public Lands, to provide for the leasing of public lands containing coal, reading in part as follows:

That all public lands and lands included in national forests containing workable deposits of coal are hereby classified as coal lands, and hereafter shall only be disposed of by leasing the same in the manner provided in this Act, and that the title in fee to all such coal lands shall remain in the United States.

**Sec. 2.** That any citizen of the United States of the age of twenty-one years who has not acquired title to coal lands from the United States, or any association of persons who are thus severally qualified, or any corporation duly empowered to transact business in the State or Territory in which the land is situated, not holding title to coal lands, may make application to the Secretary of the Interior to lease coal lands, and the Secretary of the Interior is hereby authorized to lease to such applicant or applicants not to exceed to any one person, association, or corporation two thousand five hundred and sixty acres of coal land, exclusive of the surface, in legal subdivisions of not less than one hundred and sixty acres each, which said subdivisions need not be contiguous, for a period not exceeding twenty-five years, as long as such person, association, or corporation shall conform to and abide by the terms of the lease and all of the laws of the United States and lawful regulations of the Department of the Interior as shall now or may hereafter be enacted or made.

**Sec. 3.** That the United States shall at all times have the preference right to purchase so much of the coal produced by any mine or mines operated under the provisions of this Act as may be deemed necessary for the use of its Army and Navy, and at such reasonable and remunerative price as may be fixed by the President, but the producer or producers of any coal so purchased who may be dissatisfied with the price thus fixed shall have the right to prosecute suits against the United States in the Court of Claims for the recovery of any additional sum or sums he or they may claim as justly due upon such purchase.

#### WILKES-BARRE, PENN.

Examinations for certificates for Mine Foreman and Assistant Mine Foreman were held at Pittston, Wilkes-Barre, Nanticoke and Plymouth on Apr. 22 and 23. Eighty-one men took the examination at Pittston, 65 at Wilkes-Barre, 49 at Plymouth and 55 at Nanticoke. The boards holding these examinations were presided over by Messrs. McDonald, Jennings, Davis, Williams and Walsh, state mine inspectors of the several districts contained in the Wyoming Valley.

The miners in the Five Foot Vein in the Henry Colliery of the Lehigh Valley Coal Co. are dissatisfied with the scale for rockwork, and at a meeting it was decided to refer the matter to the conciliation board for adjustment. Miners in the Red Ash Vein of the Dorrance Colliery of the same

company, being dissatisfied with the yardage paid them, adopted another course of settling the dispute, but after being idle for eight days, decided to return to work, and allow the conciliation board to settle the trouble.

To bring the mining of coal to a point where all may have a chance to see the technical parts of the industry, the representatives of the different coal companies in and about Wilkes-Barre have prepared many interesting coal exhibits for the Greater Wilkes-Barre Industrial Exposition, to be held during the week of May 10-17.

Contractors have broken ground for a model village that is to be built around the Underwood Colliery of the Pennsylvania Coal Co. on the hills east of Throop. The village will consist of 28 double houses of extra-strong construction, to withstand mine settlements. The houses will be of timber, 28x40 ft. in size, and their sills or underframes are to be of 6-in. square Georgia pine, in single sticks for the length and breadth of the houses. Several frame dwelling houses are also to be erected for the colliery bosses. The village is to be laid out with wide streets and roomy garden plots for all the houses.

It will have a central plaza, and part of its equipment will be two public baths, one for men and one for women. The baths will be built of concrete, and modern in detail. Hower & Stender, contractors, of Scranton, are in charge of the construction work. The Underwood Colliery is to be one of the most modern in this part of the state. It will open up big tracts of virgin coal, and give employment to many men for several years. It is expected that the colliery will be ready for operation in a few weeks.

#### PENNSYLVANIA

##### Anthracite

**Frackville**—The Whip-Poor-Will breaker crashed to the ground recently in the course of a high wind storm. This colliery has not been in operation for the past five years.

**Shamokin**—Fifteen firemen, employed at the Reliance colliery, went on strike, Apr. 18, claiming that they were being overworked and demanding the assistance of more men.

A tie-up at the collieries of the Mineral R.R. & Mining Co. was caused by a strike of 2500 employees, Apr. 22. The men refused to work any longer until all the men at the mines had paid their back dues to the Mine Workers' organization.

**Harrisburg**—The McDermott bill, which proposed to make it unlawful to use the electric current in the mine where miners are loading or mining coal, or in gaseous mines, has been killed in the House on the second reading. If it had become a law it would have meant an increase in the price of coal.

**Hazleton**—The 1800 mine workers at the collieries of the Lehigh & Wilkes-Barre Coal Co. have voted to return to work after a two-day "button" strike.

##### Bituminous

**Fayette City**—Four miners were badly burned by an "after explosion" in O'Neil's mine, Apr. 18.

**Finleyville**—A terrific explosion killed perhaps over a hundred miners in the Cincinnati mine of the Monongahela River Consolidated Coal & Coke Co., Apr. 23. About 70 bodies have been recovered, but it is feared that many more are in the mine still.

**Bakerton**—The gigantic frame tippie of the Sterling Coal Co. has been destroyed by fire. The tippie was the largest in that section of the country and its destruction will cripple the workings.

#### WEST VIRGINIA

**Charleston**—By a vote of 84 to 9 the striking miners of Cabin and Paint Creeks accepted the proposition made recently by Governor Hatfield, with a view toward a settlement of the long strike. While the miners attempted to attach a construction to the proposition to the effect that there shall be no discrimination against union employees, they will leave the final construction to the governor. The operators accepted the proposition a week ago and have put it into effect in their mines.

The New River miners' convention has decided not to call a strike, pending efforts which they will make to have a conference with the operators of that field, to be held in Charleston, May 10. It is said that recognition of the union will be one of the points which the miners will insist upon. Should the operators decline a conference, the miners will then consider the question of a strike.

**Wheeling**—Two hundred miners employed in the Gaylord No. 2 mine have gone on strike and the mine is idle as a consequence. The refusal of the management to employ extra drivers caused the men to strike.

#### KENTUCKY

**Louisville**—The Louisville & Nashville R.R. Co. is authoritatively reported to have consented to an important concession to the operators in the Harlan County coal field, in the voluntary removal of the 10c. differential formerly charged on coal from that district to points north of the Ohio River over the rate from the Jellico district. The action of the road is almost wholly due to the efforts of the Southern Appalachian Coal Operators' Association, which has had the matter up with the company through its traffic committee for some time.

It is also possible that the same concession will be extended by the road to the Harlan operators with reference to Ohio River crossings and Kentucky points, although this is not an association matter, and has not been determined by the road. The removal of this differential is expected to give Harlan County coal a powerful impetus in the north-western markets, where it has already established a high reputation.

**Harlan**—A systematic publicity campaign for Harlan County, Ky., and the Harlan coal fields, is being planned by the board of trade of Harlan, Ky., with a view to disseminating broadcast information regarding the resources of that section, which has experienced a remarkable development during the past two years, and which it is said is capable of still further and more extensive working. It is proposed to spend not less than \$10,000 for this purpose.

One of the plans is the publication of a prospectus, showing the exact distribution of coal throughout the county, as far as possible. It is also the intention of the backers of the plan to make a powerful effort to induce the Southern Railway to build into the county to afford competition with the Louisville & Nashville, which now has a practical monopoly of the carrying of the coal and other products of the woods and mines of Harlan.

**Spottsville**—In the Henderson district, work has been begun with a view to reclaiming the coal mine at that place, which was completely flooded by the recent high water. It is not yet known how extensive the damage is which was done by the water, but it will reach \$50,000 if the mine is not reclaimed.

#### OHIO

**Columbus**—A settlement of the miners' strike at the Trimble mine of the Hisylvania Coal Co., of Columbus, Ohio, was effected recently by John B. Moore, president of the local district of the United Mine Workers, and the officers of the company. By the terms of the settlement the company agreed to pay full wages to discharged men during the enforced idleness while a national representative of the Mine Workers conducts an investigation of the difference.

#### ILLINOIS

**Galesburg**—The Star Coal Co. has sustained a severe loss in the destruction by fire of the buildings of its large mine a short distance north of Cuba. The mine had been shut down for two weeks while improvements and repairs were being made. About 150 men are idle. The loss caused by the fire is estimated at approximately \$30,000.

The company is undecided as to whether to rebuild or not.

### FOREIGN NEWS

**Beuthen, Germany**—The strike of the miners in the upper Silesian coal fields is spreading rapidly. It is estimated that, to date, 25,000 men have laid down their tools.

**South Wales**—More than 50,000 miners in south Wales are expected to go out on strike as a protest against the employment of nonunion labor. An attempt to bring about an agreement with the employers has failed.

### RECENT COAL AND COKE PATENTS

**Automatic Dump Car**—E. L. Stoltzfus, Gap, Penn., and I. B. Miller, Paradise, Penn. 1,057,683, Apr. 1, 1913. Filed Apr. 17, 1912. Serial No. 691,312.

**Gravity Coal Bin**—S. Otis, Chicago, Ill., assignor to Gravity Coal Bin Co. a corporation of Maine, 1,052,945, Feb. 11, 1913. Filed July 11, 1907. Serial No. 383,284.

**Gravity Coal Screen and Bin**—S. Otis, Chicago, Ill., assignor to Gravity Coal Bin Co., a corporation of Maine, 1,052,946, Feb. 11, 1913. Filed July 7, 1907. Serial No. 383,285.

**Method of Producing a Substantially Complete Combustion of Fuel**—F. H. Brown, Philadelphia, Penn., 1,052,279, Feb. 11, 1913. Filed Dec. 9, 1908. Serial No. 466,530.

**Igniting Device for Miners' Safety Lamps**—P. Wolf, Zwickau, Germany, 1,052,783, Feb. 11, 1913. Filed April 30, 1912. Serial No. 694,190.

**Adjustable Shoe for Mining Machines**—C. E. Rogers, Logan, W. Va., 1,052,517 Feb. 11, 1913. Filed April 25, 1912. Serial No. 693,230.

**Apparatus for Smoke Prevention and Fuel Economizing in Connection with Steam Generators**—J. Rothwell, Walkden, Eng., 1,052,518, Feb. 11, 1913. Filed June 20, 1912. Serial No. 704,923.

**Apparatus for Utilizing Coke Oven Heat**—E. C. Morgan, assignor to Titlow Waste Heat Power Co., Uniontown, Penn. 1,054,859, March 4, 1913. Filed Jan. 28, 1909. Serial No. 474,641. Also 1,054,860, March 4, 1913. Filed April 26, 1909. Serial No. 492,133.

**Miner's Lamp**—A. L. Tombelaine, Villanuova-Minas, Spain. 1,044,001, March 4, 1913. Filed Dec. 15, 1911. Serial No. 665,884.

**Coal and Ore Washer**—H. W. Falker, Ashland, Penn. 1,055,731, March 11, 1913. Filed Sept. 7, 1912. Serial No. 719,067.

**Apparatus for Handling Coke**—W. Feicks, Bethlehem, Penn. 1,055,456, March 11, 1913. Filed March 31, 1910. Serial No. 552,667.

**Retort Coke Oven**—Chas H. Hughes, assignor to Semet Solvay Co., Syracuse, N. Y. 1,555,536, March 11, 1913. Filed August 19, 1912. Serial No. 715,736.

### TRADE CATALOGS

The Joseph Dixon Crucible Co., Jersey City, N. J., has just issued a booklet entitled "Graphite for the Boiler." The action of graphite upon scale-forming impurities in boiler-feed water is not chemical. It neither dissolves the scale nor attacks the metal. The particles of graphite gradually penetrate existing scale and soften it to such an extent as to render it easily removable. Once removed scale can never firmly adhere to the boiler surfaces as long as graphite treatment is continued.

### PERSONALS

John Mitchell, former president of the United Mine Workers of America, has been designated by Governor Sulzer, of New York, to be state labor commissioner.

C. J. Trager has resigned his position as senior inspector with the National Inspection Co., of Chicago, to accept the position of insurance manager of the Pittsburgh Coal Co. Mr. Trager took charge Apr. 16.

H. D. Johnson has recently started in the engineering business for himself. His specialties are civil, mining, consulting and economic engineering, and his office address is 617 Traders Bank Building, Scranton, Penn.

Earle Martin, of Chattanooga, Tenn., president of the Continental Coal Corporation of Tennessee and Wyoming, has resigned his position with that company. Vice-president H. L. Cory will assume the duties of president of the Tennessee company, while Vice-president W. L. Moss will assume the office of president of the Wyoming company.

## CONSTRUCTION NEWS

**Atlantic City, N. J.**—Irwin & Leighton are estimating on plans for coal pockets and bins to be erected at Atlantic City for the Atlantic City R.R. W. Hunter is chief engineer.

**Hazard, Ky.**—It is reported that the work of preparing the D. Y. Combs property near this city for production by early fall is being pushed rapidly by the parties interested in its development.

**Connellsville, Penn.**—The Tide Water Coal Co., of Pittsburgh, has taken leases on 1000 acres of coal in Parker Township, near Bruin, W. Va., and has commenced the construction of a colliery.

**Connellsville, Penn.**—It is rumored that the Northwestern System of the Pennsylvania Lines is planning to extend the Cleveland & Pittsburgh branch from Powhatan, Ohio, to a point down the Ohio River, opposite New Martinsville, W. Va.

**Rockford, Ill.**—The construction of the Chicago & Northwestern extension south through central Illinois to connect with its line in the coal fields is being pushed rapidly. The road is being doubletracked to provide for a large traffic. This will give a new and shorter route between St. Louis and St. Paul.

**Bristol, Tenn.**—The Black Mountain Coal Land Corporation has awarded to the Montgomery Coal Washing & Manufacturing Co., of Birmingham, Ala., a contract for the construction of a coal-washing plant at Pickett, Ala., including jigs, settling tank, elevating machinery, screens, etc., with an hourly capacity of 150 tons.

**Shenandoah, Penn.**—The new shaft at the Hammond colliery will soon be connected with the breaker and the hoisting slopes will then be dispensed with. It is expected that the colliery will close down about May 1 in order to make the necessary connections. The work involved will require about one month's time.

**Hazard, Ky.**—The work of construction on the tippie, tracks, and other works of the Tennessee-Hazard Coal Co. has been placed under the direction of T. H. Hopkins, of Anthras, Tenn., a well known coal operator of that section, who will push the equipment of the company to early completion, the object being to start production during the current season.

**Centralla, Penn.**—The Rhoads Contracting Co., of Ashland, has started work on an extensive stripping contract for the Lehigh Valley Coal Co., at Centralla. Operations will be started on Mt. Carmel from the northwestern side of Centralla for a distance of 7 miles. The coal is of good quality and close to the surface and it is estimated that it will require from 7 to 10 years to get it all out.

**St. Marys, Penn.**—Work on the new Shawmut bridge across the Allegheny River, at Mahoning, has been resumed since the floods subsided and completion is promised in August. Operations at Furnace Run are progressing fast. The new tippie is finished and shipments will begin as soon as cars are provided by the Buffalo, Rochester & Pittsburgh R.R., which will handle the coal from these new mines till connection can be made with the Shawmut line by the completion of the bridge.

## NEW INCORPORATIONS

**Bergholz, Ohio.**—The Bergholz Coal Co. has filed papers with the secretary of state decreasing its capital stock from \$20,000 to \$10,000.

**Los Angeles, Calif.**—The Briquette Fuel Co., capital stock, \$400,000. Directors: F. R. Thomas, F. W. Steddom, A. E. Steddom, Q. McCurdy and F. E. McCurdy.

**Cleveland, Ohio.**—The Short Creek Coal Co.; capital stock, \$600,000; to acquire coal lands and mine coal. Principal offices, Cleveland. Incorporators: J. J. Roby, E. B. Thomas and C. A. Niman.

**Fairmont, W. Va.**—The Fairmont & Cleveland Coal Co.; capital stock, \$600,000; to operate in Marion County. Incorporators: W. N. Engle, T. L. Henderson, R. R. Wallis, Anthony Bowen and J. R. Burns.

**Wellston, Ohio.**—The Oreton Mining Co. has been incor-

porated with a capital stock of \$100,000, to mine and deal in coal. The incorporators are: George B. Davis, E. B. Blair, George L. Cugle, C. Ims and N. M. Irwin.

## INDUSTRIAL NEWS

**Boise, Idaho.**—Coal has been discovered in Boise County on the farm of Julius Anson. The seam is 4 ft. thick and is a good commercial coal.

The Northern Briquetting Co. was organized last winter with a capital stock of \$500,000. The new plant is to have an initial capacity of 50 tons of briquettes a day.

**Colver, Penn.**—The Ebensburg Coal Co., which operates mines at Colver, is planning to start a dairy on its large farm. Holstein and Jersey cows have been purchased.

**Plymouth, Penn.**—The Kingston Coal Co. is installing a new electric pump on the river bank near Fletcherville Park, Plymouth, to furnish a supply of water for the Gaylord Colliery.

**Williamson, W. Va.**—The Leckie Collieries Co. expect to develop 1000 acres of coal at Williamson. They are getting a mine into shape which will have a daily capacity of 1500 tons.

**Pottsville, Penn.**—A large seam of coal has been opened near Pottsville by the St. Clair Coal Co., and it is claimed that this new operation will produce 10,000,000 tons of virgin anthracite.

**Rochelle, Ill.**—The Geo. D. Whitcomb Co. is moving into a new factory which they have just built. This step will enable them to more than double their present output of gasoline locomotives.

**Punxsutawney, Penn.**—Local men, said to be backed by New York Central R.R. interests, have leased 8000 acres of coal land at Marion Center. The acreage adjoins a large plot now held by the railroad. No price was mentioned.

**Pittsburgh, Penn.**—The Kendall Lumber Co., whose general offices are in the House Bldg., in Pittsburgh, Penn., has acquired some coal lands in West Virginia which it proposes to develop during the coming summer.

**Connellsville, Penn.**—The holdings of the Kingwood Coal & Coke Co., situated on the West Virginia Northern and the Morgantown & Kingwood railroads, in the vicinity of Kingwood, have been sold recently to Cleveland capitalists for \$60,000.

**Joplin, Mo.**—The Ellsworth-Klaner Construction Co. has leased 240 acres of coal land, one mile south of Minton, Mo., and will develop it with a steam shovel. This land was recently purchased from L. C. Chancellor by E. V. and A. K. Lanyen.

**Minot, N. D.**—The Northern Briquetting Co. has purchased a building site, consisting of 5½ acres west of the Great Northern depot. It is understood that plans for building operations are under way and will be completed in a short time.

**Rock Island, Ill.**—The Carpenter Coal Co. has received a consignment of a new coal which is being put on the market, known as the Pocahontas. It is a crushed West Virginia smokeless, mixed with hydrocarbonized pine pitch under a pressure of 100 lb.

**Seattle, Wash.**—Sixteen students from the College of Mines, University of Washington, spent Apr. 5 to 14 in an inspection trip in the western part of the state. Rock tunneling, coal mining, placer mining and milling were among the subjects studied.

**Mobile, Ala.**—According to a statement made by Vice-president J. H. Bernhard, the Alabama & New Orleans Transportation Co. will operate barges between Tuscaloosa via Mobile and Gulfport to New Orleans, and will bring down 600,000 tons of coal annually.

**Joliet, Ill.**—The Murphy Linskey Kasher Coal Co. is planning to widen its field of operations. The company has recently purchased the mining property and rights of a Pontiac company at a court sale.

**Batavia, N. Y.**—It is said that an effort will be made to recommence work on a shaft which was sunk 40 years ago for the purpose of reaching and developing a bed of coal. Parties are endeavoring to obtain the necessary finances for this purpose.

**Jellico, Tenn.**—The Interstate Coal Co. has purchased the property of the Smith-Jellico Coal Co. in this section, aggregating about 1000 acres, and has also taken over the lease on the property held by the Anchor Coal Co. The purchaser will proceed to develop the property.

**Salem, Ohio.**—The Salem Coal Co., which operated a mine east of Salem on the K. & O. electric line, has sold out its holdings to the Baldwin Mining Co. The purchaser contemplates improvements to the value of \$10,000. The capacity of the mine will be largely increased.

**Washington, Penn.**—J. V. Thompson and others have closed a deal for 800 acres of coal land in Gilmore Township, Greene County, for \$160,000. The land was bought from a number of farmers and adjoins a tract of 500 acres which was purchased by the same parties 2 weeks ago for \$100,000.

**Pittston, Penn.**—The Delahunty Dyeing Machine Co. has placed upon the market a rivetless conveyor chain with one-piece inserted attachments. This chain requires the use of no tools of any kind and only slack enough to equal twice the diameter of the pin to enable anyone to either connect or disconnect the links.

**Chicago, Ill.**—A meeting of the St. Louis, Peoria & Northwestern R.R. has been called for June 18 to consider the purchase of the Macoupin County R.R. and the issuance of \$10,000,000 in bonds to equip the roads. This purchase will mark the extension of the Chicago & Northwestern lines into the coal fields of Illinois.

**DuQuoin, Ill.**—It is rumored that a large gas company is soon to be formed in Illinois. The plan is to erect a monster coke plant at some central point, probably Marion, and to supply gas to the surrounding towns. Marion is located in the heart of the field and is considered the most practicable place for the location of the plant.

**Williamson, W. Va.**—The Skillet Fork Land Co. has taken over the 1600-acre tract of coal land on Gilbert Creek, owned by Lee Ellis. This purchase has again revived the talk of a railroad extension along the Guyan River. It is believed that the Chesapeake & Ohio will be the first road to build. The price paid was in the neighborhood of \$60,000.

**Phillipsburg, Penn.**—John Lodhrie, of Windber, has leased 400 acres of coal land near Dunio. A shaft will be sunk at once and it is expected that 1000 tons will be mined daily within a short time. The agreement provides that Mr. Lodhrie shall not mine less than 2000 tons of coal daily as soon as the developments contemplated are completed.

**Connellsville, Penn.**—W. E. Woods and M. A. Hadden have options on more than 16,000 acres of land in Jefferson Township and are now drilling test holes on their property. They have also taken options on about 6000 acres of land north of Sullivan and will shortly begin testing that, together with 12,000 acres west of Scott City which they have also optioned.

**Pittsburg, Kan.**—By order of the state inspector three mines belonging to the Central Coal & Coke Co., the Western Coal & Mining Co. and the Chapman Coal Co. have been closed down. The inspectors found unsanitary conditions, poor ventilation and an insufficient number of manholes. The companies promise to have the mines in good condition by next week.

**Charleston, W. Va.**—The West Virginia Equipment Co. has opened offices and salesrooms at 901 Kanawha St., Charleston, W. Va. This firm has secured the local agency for many of the best known and most reliable firms in the country manufacturing mining and power-plant equipment, and is, therefore, prepared to quote upon steam or mine specialties of all descriptions.

**Salt Lake City, Utah.**—D. S. Tracy and W. Norton, of Ogden, have purchased from the government 280 acres of coal land in Carbon County for \$40,600. The land lies near Spring Glen, on the Denver & Rio Grande. It is understood that the purchasers except other Ogden men to acquire adjoining lands and eventually open up a coal mine. The rate of the purchase was about \$145 an acre.

**Dante, Va.**—Recent estimates state that the Carolina, Clichfield & Ohio R.R. carries annually over its lines 20,000,000 tons of coal from the mines about Dante to the southern and southeastern markets. This road is now being extended through the Virginia-Kentucky mountain from Dante to Elkhorn City, Ky., a distance of 40 miles. The new work will include the longest tunnel in the South.

**Fort Scott, Kan.**—It is reported that the Frisco road intends to develop the coal underlying the southern part of Bourbon County. The railroad has taken options on thousands of acres of farm lands in that district and has secured leases which were held by the Miller Bros. company. A 3-ft. seam is said to underlie all this part of the county. Should coal be found the land is to be purchased for \$100 an acre.

**Royalton, Ill.**—The mine of the Royal Big Muddy Co., which went into the hands of receivers over a year ago, has been taken over and is being put in operation by J. L. Mitchell, operator of the North mine at this place, and also of mines at Coffeen. During the past week there has been a strike at this mine, and the mine manager contends that it is another case of where the miners want to dominate the policy of the company.

**Petersburg, Ind.**—Jean, Brown & Co., coal operators, have leased about 100 acres east of this city, along the E. & I. R.R. and will sink a shaft for a railroad mine. Vein No. 2 will be worked at about a depth of 130 ft. The work of pumping out the Blackburn mines continues. It will take 90 days to complete the work. Operations have been resumed at the Littles mine and Ayrshire No. 7, and two more mines of the Ayrshire company will be pumped out in 30 days.

**Wilkes-Barre, Penn.**—The new breaker of the Madeira-Hill Co., purchaser of the Joseph Stark Colliery, at Hudson, has been placed in operation. This breaker replaces the one formerly operated in connection with Mr. Stark's mine, and when in full operation will have a capacity of 800 tons daily. All machinery, including the hoisting engines, is electrically operated, the current being supplied by the Lackawanna & Wyoming Valley R.R. Co. from the Plains power station.

**Connellsville, Penn.**—The moving picture machine has been put into action by the H. C. Frick Coke Co. as a means of bringing home to all their employees the value of the "safety first" campaign. The Frick company has been the pioneer in this movement and is still leading all the work in this line. A corps of men has started to make a tour of every plant of the company in the Upper and Lower Connellsville regions, and will give these educational entertainments at each plant.

**Somerset, Penn.**—It is predicted that Somerset may have another large coal operation along the Somerset & Cambria branch of the Baltimore & Ohio R.R. in the near future. The land in question consists of 750 acres of Miller vein and Prime C coal. It is supposed that the controlling force of the new venture is the Glazier Coal & Coke Co. This company has an option on the tract and will probably begin operations in the near future. The property now has 2 openings facing the Baltimore & Ohio R.R.

**Baltimore, Md.**—The Elkhorn Fuel Co. has become permanently organized and will at once proceed with the development of its 300,000 acres of southern coal land. The Chesapeake & Ohio Ry. will construct a branch from Beaver Creek, Ky., in order to provide transportation facilities to the new field. It is proposed to begin coal shipments by the end of the year. A great part of the lands will be leased on a royalty basis to operating companies. The Elkhorn Fuel Co. was incorporated last February with a capital stock of \$30,000,000.

**Philadelphia, Penn.**—The Manor Real Estate Co. has practically completed the purchase of 18,000 acres of coal land in Indiana County, adjoining the Cambria County coal field. The average price was \$400 an acre. Five drills are already testing the new field.

It is also stated that the Manor company has entered into negotiations with the Greenwich Coal Co. and will soon take over the holdings of that concern, amounting to several thousand acres and several fully equipped modern mines. Plans have already been made to extend the Cambria & Indiana R.R. and the Cherry Hill & Dixonville R.R. into the new field.

**Clarksburg, Ark.**—J. E. Daley, president of the Scranton Anthracite Coal Co., has closed the preliminaries of a deal which involves \$2,000,000 worth of coal mining property in Jackson County. The land in question occupies all the Spadra district except that owned by the Pennsylvania Mining Co.

The new company will be composed of Eastern capitalists. Branch agencies and storage yards will be established at Kansas City and Omaha. More than 1500 miners will be employed continuously. New machinery will be installed at a cost of \$150,000 and the mines will be opened for a steady run about June 1.

**Philadelphia, Penn.**—It has been learned that a special meeting of the board of directors of the Lehigh Coal & Navigation Co. was held recently and a determination was reached to make a proposition for the purchase of a controlling interest in the Harwood Electric Co., west of Hazelton. The Harwood company has a total capital stock of \$6,831,500 and was organized last year. Possession of this concern would mean for the L. C. & N. Co., the control of the power in the Lehigh, Schuylkill and Susquehanna Valleys.

In addition to its power plant the Harwood company owns the Harwood mine which is estimated to contain about 2,750,000 tons of marketable anthracite.

## COAL TRADE REVIEWS

### GENERAL REVIEW

The May anthracite trade is starting up with a good volume of business on hand, the West and Northwest opening up particularly strong. The April demand, while somewhat less than normal, was still larger than was anticipated. There is an excellent undertone to the market and a general feeling seems to pervade the trade that there will be another shortage the coming fall.

A general shortage of labor, together with the impending strike in the West Virginia field, has had a steadying effect on the Eastern bituminous market, which is in a somewhat precarious condition. There is only a moderate buying by consumers and price cutting on the lower-grade fuels is reducing the demand for the better qualities, such as Pocahontas and New River. The accumulations at Hampton Roads are becoming so heavy that the yards are badly congested and the movement seriously restricted; the coastwise trade is light, but some relief may be obtained in the export business, which has developed to rather large proportions temporarily.

Lake shippers are opening up in a way that promises to result in a general and consistent smashing of all previous records. The demand in the Northwest is so heavy, that some are even inclined to believe that it will not be possible to supply the requirements during the time navigation is open; in such an event, this will throw a heavy load on the railroads in the Northwest just at a time when they are least prepared to handle it. Pittsburgh mine-run prices have advanced 10c. per ton to \$1.50, and the majority of the companies are sold up for the season and may even have difficulty in meeting their contracts; at other outside points some large operators are already being forced into the open market to fill out their requirements. In all of the Lake shipping districts, reports of low prices have entirely disappeared and the producers are in a stronger position than at any time this year. In Ohio the railroads are calling for bids on fuel contracts which, together with a heavier steam consumption, is creating quite an active market; prices are hard and showing no tendency to decrease.

There is a shortage of cars in the Kentucky field, and a scarcity of the small steam grades because of the light demand for the domestic sizes. In the Southern market the steam coals have become slightly heavier, due to the sharp decline in the pig-iron market. Retailers in the flooded zone in the Middlewest are still short of supplies and continue holding at the winter circular except on certain grades; mines are working good, but the railroad service has not been fully restored. There is some concern being felt, even at this distant point, over the West Virginia labor situation. Contracting has been more than usually active during the week, the closing prices being stated as satisfactory to both consumers and producers.

### BOSTON, MASS.

**Bituminous**—Prices on Pocahontas and New River continue firm, largely on account of the shortage of labor in the West Virginia fields and the threatened troubles in New River. There is only moderate buying, however, and many of the consumers are still awaiting developments in the hope that conditions will have eased materially by June or July. The accumulations at the Hampton Roads terminals are reported to be large, particularly on New River, but the export business is good and is expected to take care of any surplus. A considerable tonnage in New England has been lost to Pocahontas and New River by reason of lower prices on grades from Pennsylvania and from other districts in West Virginia.

All-rail there is a better movement and this in spite of an unusually large supply of water for the mills. A number of steam users, ordinarily dependent on Hampton Roads and Baltimore coals forwarded from tidewater points, are turning to rail delivery on account of the high prices held on the former, and the last week a considerable tonnage has been placed in that direction. Bituminous generally is in better shape than at any time since the January slump. There are fewer weak spots and for Georges Creek as well as for the choice Pennsylvania grades there is a better demand.

**Anthracite**—The demand for April coal in New England was much larger than was anticipated. Several of the deal-

ers are disappointed in the proportion shipped them at the minimum price, but all cannot be served in a single month. May starts in with a good volume of business on hand, at least for the shippers who regularly look after this market. Independent coals are still quoted freely and at a discount from the company circular, but for the most part they go begging. An active demand for hard coal is reported in every direction and with the West starting up and the opinion that anthracite may be short again in the late fall becoming more general, it looks as if in the summer months the trade would not be so slow, after all.

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Baltimore*			\$2.85	
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There seems to be a slightly better tone to the market, judging from the reports from various directions and the outlook for May business is much better than was anticipated when the spring or opening prices were first announced. This is doubtless due to the fact that the dealers are getting cleaned out of the coal laid in during the latter part of the winter, and are now in the market for fresh supplies. They have probably figured that the difference of 10c. per ton does not amount to much, anyhow. As a matter of fact, some of the coal that went into the stocks of the large companies, is now coming out again, to fill the current business; the mines are working full, and with the entire output, with the possible exception of some of the steam sizes, being absorbed, the outlook for the immediate future is excellent.

There seems to be a variety of opinion as regards business for the month of May. Some are optimistic, and claim that the tonnage will equal that of June, and that present indications are for even better business, while others point to the corresponding period of 1911, when business during the latter part of the month fell off considerably, that is, on direct sales. Most of the companies are kept busy during the late spring and early summer months, forwarding coal for stocking purposes in the Northwest and at the head of the Lakes, and a large proportion of this is not disposed of until the fall and winter.

The bituminous market still continues in a somewhat hazy condition, although it is reported that several large contracts have been consummated, at the prices of the operators. Taking the market in general, however, it is inclined to be dull. There seems to be a lack of the inferior coals, which were almost a glut during the past three or four weeks, and higher grade coals when sold, are realizing fairly good prices.

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**Bituminous**—There is a good heavy movement of soft coal on contract, but aside from this the local market is quite heavy and dull. There is little demand for spot coal, and odd tonnages are being offered at unusually low prices. However, supplies at tide are rather low, being somewhat reduced from last week, and the prompt market occupies a relatively strong position in that it is not being flooded with heavy shipments of consignment coal. On the whole, the local situation is regarded as normally favorable to the operators at the moment. One of the larger local companies reports that its contract requirements alone calls for approximately 70 per cent. of the highest production during last winter.

With most of their tonnage now fairly well covered, producers are showing a disposition to take drastic measures with consumers who are still holding off on contracts. Thus one operator who still has a number of contracts pending expects to withdraw his quotation shortly. The spot market is not quotably changed from last week, prices continuing nominally on the following basis: West Virginia steam, \$2.55@2.60; fair grades, Pennsylvanias, \$2.65@2.70; good grades of Pennsylvanias, \$2.75@2.80; best Miller, Pennsylvania, \$3.05@3.15; Georges Creek, \$3.25@3.30.

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Stove coal is still in the heaviest demand and is becoming quite short in supply. With the heavier production through April, the steam grades have naturally become somewhat longer and are now fairly easy with the exception of rice, which appears to be permanently in short supply. With the curtailed work at the mine, because of the button strikes, the car supply has been sufficient for all requirements. The indications are that May will see the trade rather less active than in previous years. The current market is about as follows:

	Circular	Individual	
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On the basis of production at the rate the operators are likely to achieve, making reasonable allowances for car and labor shortage, etc., the great majority of the companies are now sold up for the season. They may easily have difficulty in making full shipments against their present contract obligations, while on the other hand particularly good operations may result in free coal being offered from time to time. There appears to be considerable Lake demand still unsatisfied. Car supply is fairly satisfactory, but the movement is sometimes poor, closing mines occasionally for a day because the previous day's run is not moved; the first day of the week two important mines were reported closed from this cause. About 75 per cent. of the full rated capacity of the district is in operation.

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eager for coal, not because production is light, but because consumption is heavy. All reports of low-priced coal on the market have disappeared, though they were plenty enough a month or so ago. At that time even the bulls in the trade were beginning to weaken, most of them seeming to look for the market to break before long. The trade is now safe for several months at least, at prices that are decidedly more satisfactory than they were a year ago. As a rule all sellers have contracted as much as they care to this season and will not accept any more business except at their own prices.

The stiffness in bituminous is beginning to be felt in the steam sizes of anthracite, which in some instances have sold at an advance of 10c. a ton. Slack is strong, some dealers not being able to get as much of it as they need. With such conditions in effect all bituminous prices are strong, quotations being on the basis of \$2.80 for Pittsburgh select lump, \$2.65 for three-quarter, \$2.55 for mine-run and \$2.15 for slack. Coke is also stronger, the top price being \$5 for best Connellsville foundry.

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Shipments appear to be rather light at the present time, a number of the mines taking advantage of the dull period to effect long-needed repairs. The car supply is also rather poor, considerable of the coal equipment having been withdrawn for use in repairing the tracks washed out by the flood. It is believed in some quarters that the long delay to traffic occasioned by the flood will set back the general movement so materially that there are probabilities of an acute situation developing the coming fall. It seems reasonable to believe that Lake shipments will not be up to the usual tonnage during the early part of the season, so that the total movement to the Northwest, by way of the Lakes, will not be up to requirements. In such an event, the deficiency will have to be made up by rail shipments which will throw a heavy strain on the roads just at a time when they are least prepared to handle it.

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Retailers are trying to curtail their stocks for the coming summer. Outside of an occasional order for domestic sizes, there will be little doing in that department until the period for stocking up. Retail stocks are slightly larger than ordinary at this time of the year, due to the expected demand after the recent high waters.

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## COAL TRADE REVIEWS

### GENERAL REVIEW

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Retailers are trying to curtail their stocks for the coming summer. Outside of an occasional order for domestic sizes, there will be little doing in that department until the period for stocking up. Retail stocks are slightly larger than ordinary at this time of the year, due to the expected demand after the recent high waters.

Lake trade continues active and there is every indication for a good demand from the Northwest for the entire season. Dockmen are clamoring for coal and every effort will be made to ship a good tonnage. Prices on the docks are at the same level which prevailed in 1911. Last season a decline

of 10c. on the ton caused some trouble among lake shippers. Prices f.o.b. vessels are \$2.10 instead of \$2, the price in 1912.

Production shows a small increase in every mining section in Ohio. In the Hocking Valley, the output is estimated at 70 per cent. of the average and in the Pomeroy Bend district it is about 65 per cent. In the domestic fields the output has been small. In eastern Ohio production is slightly more than 50 per cent.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump.....	\$1.50	.....	\$1.50	\$1.50
4-inch.....	1.35	\$1.25	1.35	1.30
Nut.....	1.25	.....	1.25	.....
Mine-run.....	1.15	1.10	1.15	1.10
Nut, pea and slack.....	0.90	.....	0.90	0.90
Coarse slack.....	0.80	0.85	0.80	0.80

#### HAMPTON ROADS, VA.

Shipments from tidewater during the last week have fallen off considerably at all the piers. The early part of the week saw some large export shipments for the Austrian and Italian Governments, these two countries so far this month having taken approximately 40,000 tons. There has also been a fair demand by the U. S. Navy, one of the large colliers taking about 13,000 tons. Coastwise business, however, has been slack during the entire week.

There has been no change in prices for standard coals which remain at \$2.60 to \$2.85 the latter being for contract business. There have been small sales of high-volatile coals at \$2.45 and \$2.50 but very little demand for this particular grade. On account of the small dumping during the week there is an accumulation of coal and the yards at the three ports are in a badly congested condition. Unless shippers arrange to move coal promptly there is a prospect of a shortage of cars and the railroads are urging shippers to make disposition of consignments.

Ground has been broken and work commenced on the coal storage plant at Sewalls Point, mention of which was made last week and it is expected when this is completed that it will take care of in the neighborhood of 50,000 tons.

Advices from England are that David A. Thomas, the British coal operator, who was here some months ago looking over the coal terminals of the different roads, sailed for this country on the S.S. "Olympic" Apr. 22. It is said that Mr. Thomas is expected in Norfolk again shortly to arrange for the exportation of coal to South America and that his shipments will probably amount to 4,000,000 tons during the first year.

#### BIRMINGHAM, ALA.

The local steam-coal market has grown slightly heavier during the week. There is an additional sympathetic weakness owing to the sharp decline in the pig-iron market, around which all other markets in this district revolve. It is believed that iron has touched bottom and that the steam coal and coke markets will not be seriously weakened by the closing down of any local furnace or steel plants.

The export tonnage from Alabama mines is the largest in the history of coal mining in Alabama. Dumping facilities are being enlarged at ports on the Gulf of Mexico to take care of increased export coal business already realized and the further increase that is sure to come with the opening of the Canal.

Prices on Montealeo fancy domestic lump (the highest price domestic coal in Alabama) are quoted as follows for the coming season: May delivery \$3.15 with a 10c. advance in June, 15c. in July and August, 10c. in both September and October, reaching the maximum of \$3.75, which price will be maintained through to February.

#### LOUISVILLE, KY.

The general situation in Kentucky remains unchanged except that there has been some easing up in the pressure for steam grades in certain sections, although there is still a noticeable scarcity of nut and slack. Western Kentucky operators report a sufficient production of these grades to meet requirements only; there is certainly little to be had in the spot market, and prices are exhibiting a gratifying steadiness.

Lump and block, and the cheaper domestic grades are practically unsalable at the present time and apparently with no prospects of any demand appearing in the immediate future. The customary storage season for these grades is now at hand but dealers appear to be holding off for some reason, in spite of the fact that prices are certainly attractive. This meager demand for the larger sizes is the cause of the short supply of the screened grades.

There has been some car shortage in nearly all the producing sections, especially on the lines of the Louisville & Nashville. This condition is ascribed to the heavy movement of perishable freight from the South, coal and other slow moving commodities being given little consideration at such a time. The long standing embargo of the Louisville

& Nashville against Chicago, and other Northwestern points, together with the large amount of equipment still tied up or seriously delayed in the flood zone, is also operating against the favorable movement of coal.

Eastern Kentucky lump is quoted down to \$1.40 and No. 2 mine-run at 85¢@90¢; Western Kentucky nut and slack is strong and active at 85¢, with pea and slack at 35¢@50¢; nut is quoted at \$1.05@1.10, lump, \$1.30 to 1.25 and mine-run, 80¢@95 cents.

#### KNOXVILLE, TENN.

There has been a decided improvement in the local market within the past 30 days, due to the favorable weather. This is especially true of the territory north of the Ohio to which considerable domestic coal is now moving. Operators are well satisfied with sales for May and June, quite a number having disposed of their entire output for those months.

While there has been no advance in prices the market is strong, and with continued improvement, quotations are almost certain to advance. Operators are therefore well satisfied, as the demand for domestic after July 1 will naturally be strong. The flooded conditions in the North have caused a car shortage and there has been a strong demand from the flooded district. The steam market is satisfactory.

#### INDIANAPOLIS, IND.

Retailers in this city are still charging their winter schedule of prices, the highest in the history of the trade. The only exception is a reduction of 50c. in the price of Indiana lump from \$3.75 to \$3.25. They have not yet received any shipments from the Eastern fields since the reduction of prices at the mines there, so have none of the cheaper coal to offer.

The railroad service has not yet been sufficiently restored to permit of coal shipments. It is possible this has something to do with the running schedule at Indiana mines, which are getting in about four to five days a week, notwithstanding the spring weather which is limiting the demand for domestic grades. Operators report a normal business from steam users which the mines have been readily filling, with the probable exception of screenings. Prices hold steady at the recent level as follows: Mine-run \$1 to \$1.20; screenings 90c. to \$1. Some mines and factories have not yet recovered from the unprecedented flood early in April, but with these exceptions, the industries of the state seem to be well engaged.

#### CHICAGO

Conditions in the Chicago market are comparatively quiet at present. The warm weather has caused dealers to concentrate their attention on the steam-trade business, and renewals of contracts are being made with evident satisfaction on the part of both the dealer and consumer.

Demand for Eastern coal is reported to be good, although some concern is felt over conditions in the West Virginia strike zone. The screenings situation is normal, and contracts are being generally renewed with Franklin County operators. The demand for Springfield coal is confined to the steam trade exclusively, with mines putting in about half time. Wholesalers are somewhat disappointed in finding that the large demand for anthracite, usually expected at this time when April prices end, failed to materialize.

A great deal of interest is being taken in gas coal. One Western buyer is in the market for 750,000 tons of this product. It is reported that there will be an increase of 10,000,000 tons in the consumption of gas coal in the Western territory this year. The price of Youghiogheny coal has advanced to \$1.40 for three-quarter inch lump on contract. Prices for Kanawha have advanced to \$1.25@1.30. Byproduct coke is quoted all the way from the circular price of \$4.45 up to the premium price of \$4.75. The hard cokes are firm.

Prevailing prices in Chicago are:

	Springfield	Franklin Co.	Clinton	W. Va.
Domestic lump.....	\$1.97@2.07	\$2.30@2.40	\$2.27	
Egg.....		2.30@2.40		\$3.95
Steam lump.....	\$1.82@1.87		2.17	
Mine-run.....	1.82@1.87	2.20@2.30	1.97	3.30
Screenings.....	1.62	1.95@2.00	1.62	

**Coke**—Connellsville and Wise County, \$6@6.25; byproduct egg, stove and nut, \$4.45@4.75; gas house, \$4.65@4.75.

#### DETROIT, MICH.

**Bituminous**—There seems to be no inclination on the part of the shippers to cut prices in order to get business, and, generally speaking, the situation at the moment, is materially stronger. More contracts are being closed, there does not seem to be any great amount of track coal, and the movement is quite normal for this period of the year. Consumers are uniformly hesitating at the advanced prices, but after additional inquiry at other points they are usually willing to close. The market in general is showing a strong, healthy tone, and dealers are very much encouraged over the outlook.

The prevailing quotations on soft coal are about as follows:

	W. Va. Splint	Gas	Hock- ing	Cam- bridge	No. 8 Ohio	Poca- hontas	Jackson Hill
Domestic lump.....	\$1.50	.....	.....	.....	.....	\$2.25	\$2.00
Egg.....	1.50	.....	\$1.35	.....	.....	2.25	2.00
1½-in. lump.....	1.25	.....	.....	.....	.....	.....	.....
4-in. lump.....	1.15	\$1.15	\$1.15	\$1.15	\$1.15	.....	.....
Mine-run.....	1.10	1.10	1.10	1.10	1.10	1.50	.....
Slack.....	1.00	1.00	1.00	1.00	Open	Open	.....

**Anthracite**—It is generally conceded that the local hard-coal trade is a trifle disappointing and rather below that of previous years. Shippers generally appear to have sold their April tonnages without any difficulty, but the demand as a whole has fallen below that of previous years. Consumers have grievances against the producers among which are the poor preparation and inadequate shipments last fall.

#### ST. LOUIS, MO.

Conditions are practically the same in St. Louis and adjacent territory as they have been for the past few weeks. A few steam contracts are being signed up, and as usual the operators are hungry for the business and are not taking into consideration the fact that there is liable to be a suspension on Apr. 1, 1914, with the usual car shortage previous to that time, and the season of high prices.

Aside from the big retail companies, no anthracite is being bought, inasmuch as the price war between the big companies still continues. During the past week there has been an accumulation of No. 1 washed nut, but the price has not dropped off any.

The prevailing circular is:

	Cartersville and Franklin Co.	Big Muddy	Mt. Olive	Standard
2-in. lump.....	.....	.....	.....	\$0.90
3-in. lump.....	.....	.....	\$1.20	.....
6-in. lump.....	\$1.15 @ 1.20	.....	1.25	1.05
Lump and egg.....	.....	\$2.25	.....	.....
No. 1 nut.....	1.05 @ 1.15	.....	.....	.....
Screenings.....	0.90 @ 0.95	.....	.....	0.85
Mine-run.....	1.00 @ 1.10	.....	.....	0.80
No. 1 washed nut.....	1.35	.....	.....	.....
No. 2 washed nut.....	1.35	.....	.....	.....
No. 3 washed nut.....	1.35	.....	.....	.....
No. 4 washed nut.....	1.35	.....	.....	.....
No. 5 washed nut.....	1.10	.....	.....	.....

The St. Louis circular on hard coal for May is as follows: Chestnut, \$7.50; stove and egg, \$6.80; grate, \$6.55. Smokeless lump and egg is \$4.55 with mine-run \$4; byproduct coke is \$5 and gas house \$4.75.

#### MINNEAPOLIS—ST. PAUL

It is generally thought that the dock men will hold firm this year on prices and some even look for an advance in dock quotations. Prices in cargo lots are higher and then, too, the Eastern offices are demanding more profit from the Northwestern interests and it would seem that the strife for tonnage is due to come to an end. The docks are now all activity as boats are expected at any time.

There was only a scattering buying during the first two weeks of this month by country merchants. This is the time for the visit of the tax assessor and everyone endeavors to bring stocks down to the minimum at this time of the year. Illinois coal is holding very firm for this season of the year and if prices continue firm the rest of the month there is not much chance for coal being sold this summer at the cost of production.

#### PORTLAND, ORE.

A cargo of coal arrived in the Columbia River this week from Australia. This is the first Australian coal brought to this section for several months or since last fall when a couple of cargoes arrived early in the season. The cargo represented less than 1000 tons, and came over virtually as ballast since the vessel had delivered a cargo of lumber and was booked to return to this coast.

Market conditions here are unchanged, and none are anticipated till summer rates are announced in a month or so.

## PRODUCTION AND TRANSPORTATION STATISTICS

#### VIRGINIAN RAILWAY

Total shipments of coal over this road for March of the current year were 380,091 tons as compared with 303,159 tons for the same month last year. Shipments for the first two months of the year were 1,233,244 tons for the current period and 914,605 tons in last year.

#### THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended Apr. 15, as follows:

	Surplus	Shortage	Net*
New England Lines.....	167	33	341
N. Y.; New Jersey, Del.; Maryland; Eastern Penn....	5,221	0	5,221
Ohio; Indiana; Michigan; Western Pennsylvania....	5,856	434	5,422
West Virginia, Virginia, North & South Carolina....	776	1,069	293
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida....	132	195	68
Iowa, Illinois, Wis., Minn.; North & South Dakota....	2,211	71	2,144
Montana, Wyoming, Nebraska.....	1,965	5	1,960
Kansas, Colorado, Missouri, Arkansas, Oklahoma....	2,056	68	1,880
Texas, Louisiana, New Mexico.....	613	33	580
Oregon, Idaho, California, Arizona.....	2,721	21	2,700
Canadian Lines.....	127	11	116

Totals.....	21,845	2,196	19,649
Greatest surplus in 1912 :Apr. 25;.....	94,692	2,144	92,548
Greatest shortage in 1912 :Oct. 10;.....	6,491	14,897	8,406

\*Bold face type indicate a surplus.

#### NORFOLK & WESTERN RY.

The following is a comparative statement of the coal and coke shipments over the lines of the N. & W. Ry. for the months of March and the first three months of 1912 and 1913 in short tons:

Destination	March		3 Months	
	1912	1913	1912	1913
<b>Coal</b>				
Tidewater, foreign.....	146,089	120,288	365,982	387,294
Tidewater, coastwise.....	286,340	327,631	822,283	973,751
Domestic.....	1,353,330	1,303,239	4,069,743	4,333,531
<b>Coke</b>				
Tidewater, foreign.....	8,859	70	17,403	10,034
Domestic.....	140,298	147,660	401,318	438,794
Total.....	1,934,916	1,898,888	5,676,729	6,143,404

## FOREIGN MARKETS

#### GREAT BRITAIN

Apr. 18—Prompt supplies are difficult to arrange, while for next month's loading business is not very active at present. There is, however, no weakness in prices.

Quotations are approximately as follows:

Best Welsh steam.....	\$4.92@5.04	Best Monmouthshires.....	\$4.50@4.62
Best seconds.....	4.74@4.92	.....	4.26@4.32
Seconds.....	4.62@4.74	Best Cardiff smalls.....	3.72@3.84
Best dry coals.....	4.80@5.04	Seconds.....	3.66@3.72

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days—less 2½%.

## COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Apr. 26:

Stocks	Week's Range			Year's Range	
	High	Low	Last	High	Low
American Coal Products.....	87	87	87	87	87
American Coal Products Pref.....	109½	109½	109½	109½	109½
Colorado Fuel & Iron.....	34½	32½	32½	41½	31
Colorado Fuel & Iron Pref.....	.....	.....	155	155	150
Consolidation Coal of Maryland.....	102½	102½	102½	102½	102½
Lehigh Valley Coal sales.....	225	210	215	.....	.....
Island Creek Coal, com.....	52	51	51	.....	.....
Island Creek Coal Pref.....	85	84	84	.....	.....
Pittsburgh Coal.....	20	18	18	24½	19
Pittsburgh Coal Pref.....	83½	79½	80½	95	79½
Pond Creek.....	22½	19½	19½	23½	19½
Reading.....	165½	159½	160	168½	162½
Reading 1st Pref.....	91	91	91	92½	89½
Reading 2nd Pref.....	93	92½	92½	95	87½
Virginia Iron, Coal & Coke.....	50	50	50	54	44½
Bonds	Closing		Week's Range	Yea's Range	
	Bid	Asked		or Last Sale	Range
Colo. F. & I. gen. s.f.g. 5s.....	96½	Sale	96½	96½	99½
Colo. F. & I. gen. 6s.....	107½	.....	107½	June '12	.....
Col. Ind. 1st & coll. 5s. gu.....	78½	79	80	80	78½
Cons. Ind. Coal Me. 1st 5s.....	75	80	85	June '11	.....
Cons. Coal 1st and ref. 5s.....	.....	94	93	Oct. '12	.....
Gr. Riv. Coal & C. 1st g 6s.....	.....	100	102½	April '06	.....
K. & H. C. & C. 1st s f g 5s.....	.....	.....	98	Jan. '13	98
Pocah. Con. Coll. 1st s f 5s.....	.....	87½	87½	Mar. '13	87½
St. L. Rky. Mt. & Pac. 1st 5s.....	78	79	76	Mar. '13	76
Tenn. Coal gen. 5s.....	100	Sale	100	102½	100
Birm. Div. 1st consol. 6s.....	102	103½	101	April '13	101
Tenn. Div. 1st g 6s.....	103½	102	102	Feb. '13	102
Cah. C. M. Co. 1st g 6s.....	101½	104	110	Jan. '09	.....
Utah Fuel 1st g 5s.....	.....	84	79½	Feb. '13	79½
Victor Fuel 1st s f 5s.....	.....	91	95	95	94½
Va. I. Coal & Coke 1st g 5s.....	95	97	95	95	98

No Important Dividends were announced during the week.

# FINANCIAL DEPARTMENT

## Delaware, Lackawanna & Western R. R.

The following are excerpts from President Wm. H. Truesdale's annual report for the year ended Dec. 31, 1912:

**Earnings**—The gross earnings were substantially larger than for any previous year, notwithstanding that our mining operations were suspended during April and May pending negotiations for a new schedule of wages for mine employees. The earnings from the transportation of coal were thus reduced by \$816,421.

**Coal Mining**—The net income from the operations of this department was \$2,111,897, or \$427,629 more than in 1911.

From the coal produced there was also realized \$1,773,611 (\$32,206 less than in 1911), being the estimated value in the ground of such portion of the coal owned in fee as was mined during the year. Further progress has been made in the development of the new colliery, the Loomis, also, work is fairly under way in opening up the "Laurel Run" tract. Shafts are being sunk and other preparations made for mining the coal and preparing it for market through our Pettebone Breaker.

The tonnage produced from our collieries and washeries was 8,166,790 tons, or 278,894 tons less than in 1911, entirely due to the suspension of mining operations during the six weeks in April and May last covered by the negotiations for a new wage scale. The agreement finally reached involved a substantial increase in the wages for nearly all mine employees and covers the four years ending Mar. 31, 1916.

During the past 11 years there has been a continuous increase in the cost of mining coal; for 1912 the cost was 62c. per ton higher than in 1901. The wages of mine employees continue to increase steadily, and more employees are required each year to produce a given quantity of coal. The prices of all classes of material used are higher than ever before. In the older workings the output of coal very largely comes from either the surface veins or the thin ones lying below all those others which in the mining operation require a large amount of rock excavation and dead work. In the deeper and thinner veins the company has introduced a large number of coal-cutting machines, operated by electricity, which enable it to produce coal profitably from these veins, which it could not otherwise do. Regardless of all that is reasonably possible in the future, there is no doubt but that the cost of producing anthracite coal will in the future, as in the past, show a steady increase from year to year. The taxes levied on the coal properties also increased in 1912 more than 24%.

The outlook for the anthracite industry for the coming year seems very favorable, and present indications are that the demand for coal will be equal to the supply. It should be realized, however, that in all probability the maximum annual production of anthracite coal from the Pennsylvania fields has already been reached.

**General Remarks**—The Syracuse Binghamton & New York R.R. was leased to this company in perpetuity at a rental of 12% on the capital stock, effective Oct. 1, 1912, and has since been operated as a part of our system.

At the close of the year business generally throughout the country was in a highly prosperous condition, and the railway traffic of the country was at its maximum. The promise for 1913 is all that could be desired as respects volume of business and gross earnings, which, if no setback occurs and the crops of the new year are up to the average, should exceed 1912.

There is no cessation in the efforts made in Congress and the state legislatures to secure the passage of additional laws regulating railway operations, increasing the number of employees, further decreasing their hours of service regardless of the reasonableness of so doing. There is no mistaking the trend of affairs. It is continuous toward the absolute control of all the activities of the railways by Government, national or state, stopping only at responsibility to the owners of them for their financial outcome.

EARNINGS, EXPENSES AND CHARGES				
Revenue from—	1912	1911	1910	1909
Coal.....	\$13,280,304	\$14,096,725	\$14,067,778	\$14,464,221
Miscellaneous freight.....	13,999,359	12,462,679	12,443,473	11,393,860
Passengers.....	7,722,953	7,696,800	7,290,943	6,825,430
Mail, express and misc.....	2,561,895	2,330,359	2,250,738	2,131,500
Total.....	\$37,564,511	\$36,586,563	\$36,052,932	\$34,815,011

Expenses—	1912	1911	1910	1909
Maint. of way, &c.....	\$4,646,175	\$4,144,940	\$3,904,931	\$3,298,390
Maint. of equipment.....	6,128,762	5,762,903	5,034,605	4,797,073
Traffic expenses.....	822,835	779,489	716,347	651,888
Transportation expenses.....	11,778,982	10,864,107	10,379,455	9,340,845
General.....	769,668	767,213	688,110	657,314
Total.....	\$24,146,423	\$22,318,652	\$20,623,448	\$18,745,510
Net revenue.....	\$13,418,088	\$14,267,911	\$15,429,484	\$16,069,501
Net rev. outside oper.....	561,622	6408,705	210,756	364,685
Total net revenue.....	\$13,979,710	\$14,676,616	\$15,640,240	\$16,434,186
Taxes.....	1,771,980	1,834,640	1,518,925	1,394,500
Net, after taxes.....	\$12,207,730	\$12,841,976	\$14,121,315	\$15,039,686
Add—				
Interest on investments.....	\$404,743	\$446,685	\$405,818	\$391,030
Dividends on stocks.....	820,106	226,661	240,165	394,530
Coal department earnings.....	3,885,508	3,490,085	3,381,262	4,628,771
Int., disc't & exchange.....	3,416	Cr. 6,399	19,756	45,909
Rentals—miscellaneous.....	179,458	199,509	185,582	154,700
Hire of equipment.....	199,690	239,014	201,558	175,141
Miscellaneous (net).....	125	226	113,855	c2,683,829
Total.....	\$17,700,775	\$17,437,757	\$ 8,669,311	\$23,513,595

Deduct—	1912	1911	1910	1909
Interest on bonds.....	\$6,486	\$6,486	\$6,486	\$3,243
Rentals leased lines.....	5,688,588	5,204,889	5,160,140	5,160,140
Rentals joint facilities.....	158,690	224,043	238,584	271,563
Renewals and betterments.....	1,720,698	2,200,628	2,542,117	2,099,454
Miscellaneous.....	40,307	7,527		
Discount on bonds sold.....	43,935	162,142		
Dividends (10%).....	3,014,400	3,014,400	3,014,400	y2,817,216
Extra dividend (10%).....	3,014,400	3,014,400	3,014,400	y3,014,370
Total.....	\$13,687,504	\$13,834,515	\$13,976,127	\$13,365,986
Balance, surplus.....	\$4,013,271	\$3,603,242	\$4,693,184	10,147,609

\*Includes value in ground of coal owned in fee and mined during the year in conduct of mining operations; In 1912, \$1,773,611; in 1911, \$1,805,817.

### Results of coal department were:

	1912	1911	1910	1909
Earnings.....	\$21,706,755	\$22,593,288	\$21,786,127	\$35,665,865
Expenses.....	17,821,247	19,103,203	18,404,865	31,037,094
Profit.....	\$3,885,508	\$3,490,085	\$3,381,262	\$4,628,771

b Net revenue from outside operations as above in 1912 was derived as follows:  
Oper. revs., \$3,529,131, less exp., \$2,967,509, leaving \$561,622.

c Includes the special item of profit from sale of 37,000 shares of Lehigh Valley R.R. stock, \$2,622,730.

x Also 35% extra dividend (\$10,550,400), paid Dec. 20, 1911 in stock of the Lackawanna R.R. of New Jersey.

y Also 50% extra cash dividend paid July 20, 1909 and 15% stock dividend paid Aug. 2, 1909 from profit and loss.

### GENERAL BALANCE SHEET DECEMBER 31

Assets—	1912	1911	Liabilities—	1912	1911
Road and equipment.....	\$41,553,707	\$38,960,907	Common stock.....	\$30,277,000	\$30,277,000
Securs. of property affil., &c., cos.—unpledged.....	9,708,281	9,580,963	Premiums realized on capital stock.....	70,720	70,720
Adv. to affil., cos. for construction, &c.....	4,954,140	4,005,885	Mortgage bonds.....	320,000	320,000
Misc. investments (physical prop.).....	3,097,849	2,937,472	Loans and bills payable.....	26,667	26,667
Cash.....	1,252,755	482,761	Traffic, etc., bal.....	650,593	524,731
Securs. in treasury.....	344,900	344,900	Vouchers and wages.....	3,563,168	3,467,463
Marketable securities.....	10,458,781	10,783,362	Misc. accts., etc.....	162,120	803,635
Loans and bills received.....	17,539	16,518	Matured interest, dividends, etc.....	1,297,300	1,320,712
Traffic, etc., bal.....	201,269	165,291	Unmatured interest, divs., etc.....	1,290,552	1,207,086
Ag'ts. and conductors.....	948,442	578,277	Taxes accrued.....	1,738,887	1,839,157
Misc. accts. rec. etc.....	4,226,468	3,990,663	Operating reserves.....	107,131	61,553
Materials and supplies.....	2,989,966	3,153,588	Other def'd credit items.....	279,547	227,738
Advances to leased lines, etc.....	3,621,208	2,985,181	Appropriated surplus.....	614,198,218	12,477,520
Prepaid rents, etc.....	6,901	14,699	Profit and loss.....	29,515,902	25,502,631
Oth. def. deb. items.....	115,600	127,046			
Total.....	\$83,497,805	\$78,127,513	Total.....	\$83,497,805	\$78,127,513

a After deducting reserve for accrued depreciation, \$6,711,301. b Appropriated surplus represents renewals and betterments to property paid out of income since June 30, 1907.